Installation and Operating Instructions

ANTTI GRAIN DRYER
Agrosec Mobile Dryer
Vacboost M13

408111 (en)

Agrosec
Grain Handling

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CONTENTS

AGROSEC MOBILE DRYER VACBOOST M13 4
SELECTING LOCATION FOR THE DRYER 4
FOUNDATION 4
THE SPACE REQUIRED FOR THE INSTALLATION 5

PRESENTATION OF THE MACHINE 5
SAFETY 6

INSTALLATION OF THE ANTTI AGROSEC VACBOOST 6
Principle drawings of different dryer types with accessories 8
Base with frame 18
Sections, air channel ends 18
Top tanks and cover with handrails 18
Installing the upper limit sensor 19
(Capacitive, adjustable) 19
Installing the elevator 19
Iso pultattava kaatoallas 19
Wire control of the 3-way divider and the circulation pipes 20
Fuel pipes 24
Installing the debris piping for the pre-cleaner 24

Electric installations 25
1. Installation 27
1.1 Installing the LTM thermostat 27
1.2Installing the fire thermostat 28
1.3Installing the temperature sensors 29
1.4Installing the upper limit sensor 29

2. STARTING UP 30
2.1Elevator 30
2.2 Pre-cleaner 30
2.3Feeder 31
2.4Blower 31
2.5Burner 31
2.6LTM thermostat 31

3. Functions of the control centre 32
3.1 Switches and buttons 32
3.1.1 Operation switch 32
3.1.2 Operating switch for the elevator 33
3.1.3 Operating switches for other appliances 33
3.1.4 Bypass button 34
3.1.5 Start button 34

3.2 Operating hour counter 34

3.3 Outlet air and drying temperature thermostats 34

3. 4 Cooling timer 35
3.4.1 Display 35
3.4.2 Setting the cooling time 35
3.4.3 Interrupting the cooling 35

3.5 Frequency converter controlled feeder 36

3.6 Signal lights 37
3.6.1 Signal lights of the appliances 37
3.6.2 Cooling 37
3.6.3 Signal light "drying finished" 37
3.6.4 Level guard 37
3.6.5 Circulation failure 37
3.6.6 Overheating alarm 38
3.6.7 Burner failure 38

3.7 Motor protection switches 38

3.8 Circuit breakers 39

4. Operation 39
4.1 Filling 39
4.2 Drying and cooling 39
4.2.1 Drying the first batch 39
4.2.2 Starting the drying process 40
4. 3 Emptying 40

5. Malfunctions 40

THERMAL INSULATION 41
OPERATION INSTRUCTIONS FOR THE DRYER MACHINERY (detailed instructions) 41
Initial adjustment and checking of the dryer 41
Drying 41
Cooling 42

DRYING TECHNICS 43
MAINTENANCE AND OPERATING ADJUSTMENTS 44
ECONOMICAL DRYING 45
POSSIBLE MALFUNCTIONS 48
SERVICE AND WINTER MAINTENANCE 48

GUARANTEE 49

EU Declaration of Conformity 50

AGROSEC MOBILE DRYER VACBOOST M13

Read the Installation and Instruction Manual carefully before installing the machine and putting it into operation.

SELECTING LOCATION FOR THE DRYER

Locate the grain dryer as a part of the farm's centre of operations, taking into account possible traffic, noise and dust problems. Construct the roads in a manner enabling them to be trafficked with a full trailer round the year. If possible, locate the heater on the facade side of the building. When selecting location for the heater, observe in particular that it requires large amounts of clean air. The suction opening of the heater must be located as far from the outlet air pipes as possible, on the other side of the building. If you have doubts concerning the location, negotiate in advance with the local building and road authorities, and the fire chief.

The distance from the grain dryer to the land of the neighbour shall be at minimum 15 m, to the neighbouring building 20 m, to your own residential building15 m, and to an outbuilding 12 m. (The minimum distance to your own buildings may vary from municipality to municipality, depending on how the new regulations are being locally interpreted). For dryers of category P2, the required distances may be shorter. Under certain conditions, a package dryer may fall into category P2. Consult the local fire chief or building supervisor for detailed instructions.

FOUNDATION

GROUND PRESSURE

When selecting suitable founding method for your dryer, apply the following base values for different soil types:

Moraine	0,4 – 0,8 MN/m2
Gravel	0,2 – 0,6 MN/m2
Sand	0,15 – 0,5 MN/m2
Fine sand	0,1 – 0,4 MN/m2

Clay and fine silt:

- soft (easy to work)	0,025 MN/m2
- tough (hard to work)	0,050 MN/m2
- solid (extremely hard to work)	0,1 MN/m2

If you consider that the load-bearing capacity of the soil is difficult to determine, assign a specialist or order a ground survey. It is often a good idea to establish the form of the rock by means of a ground survey or a test excavation. Typically, the ground pressure caused by a dryer is 0.5–2.0 kg/cm^2 when the foundation is of raft type.

THE SPACE REQUIRED FOR THE INSTALLATION

The minimum requirement is that the foundation drawings are being followed.
In addition, you must take into account the space required for the installation, and the load-bearing capacity of the soil under the mobile crane.
The goods to be transported can be over 3 metres wide and fairly long. Therefore, the access to the foundation of the dryer must be unobstructed, and sufficient space must be reserved for turning the vehicles.
For the erection of the dryer, the mobile crane must be provided with unobstructed access near the installation site and a sufficiently sturdy standing base. There must not be any aerial electric or telephone lines at the erection site, within the reach of the mobile crane.

Instruction manual for erecting and operating the machine

This manual is intended for professional farmers. The use of the machine requires normal skills and general knowledge of farming.

Grain dryer type

This manual deals with installation and use of ANTTI AGROSEC VACBOOST MOBILE DRYER.

PRESENTATION OF THE MACHINE

- Grain dryers are intended for drying of grain and seeds.
- The drying process comprises four phases:

1. During the filling phase, the elevator transfers the grain from the filling hopper of the dryer into the dryer.
2. During the drying phase, the grain circulates inside the dryer, and simultaneously, hot air is being sucked through the grain layers.
3. During the cooling phase, the grain is being circulated inside the dryer, and cold outside air is being sucked through the grain layers.
4. The ready-dried and cooled material is transferred by means of an elevator to the storage or to be loaded.

The dryer is delivered as pre-assembled units, and the final assembly takes place at the installation site.

- The pedestal of the dryer comprises the dryer base and the feeder. The drying sections are installed on top of the base.
- The drying unit comprises drying sections with triangular air ducts. The top tanks are stacked on top of the drying unit.
- Dryer type: The AGROSEC VACBOOST 3W with seven feeder blades.
- The volume of the dryer depends on the number of the sections and the top tanks, being installed one on top the other.
- In addition to the main parts itemised above, the delivery also includes a number of smaller parts, the installation of which is described more in detail later in these instructions.

SAFETY

The dryer base has moving feeder parts that can cause an injury, if all the cover plates and hatches are not properly closed, while the machine is in operation!

NOTE!
Before opening or closing the bottom troughs, ensure that the inspection and cleaning hatches in the dryer base are closed.

Follow the local instructions for occupational safety.

INSTALLATION OF THE ANTTI AGROSEC VACBOOST

Refer to the erecting instructions 408076 for the dryer for installation of the sections and the other basic components. These instructions deal with the installation of the mobile dryer's model-specific components.

The installation work of the dryer requires precision. The work must be carried out on various levels, even at high elevations. Therefore, in addition to good installation skills, the work requires proper scaffolding/use of aerial work platforms and observation of all the safety issues. Especially, the dryer base and the sections are heavy. Lifting them requires sufficiently powerful machinery.
Pre-connected wiring is used for installations in the electric centre. Before starting the use, make sure that all the electric appliances are in order!

Weight of the dryer's components:

Base with heater and blower	~2400-2700 kg
Section (with two air channel ends)	~1400-2000 kg
Top tank	~300 kg
Top tank with cover, handrails and pre-cleaner	~700 kg
Elevator	~450-590 kg

Please observe, when lifting the heavy components of the dryer:

- use all the lifting lugs on the components
- use the lifting lugs and a bracing when lifting the ready-assembled top tank
- ensure that the lifting hooks stay in position in the lugs, and that the crane being used is sufficiently powerful
- never go under or too near the components to be lifted
- the crane must be able to lower the component to be lifted slowly and precisely into position
- reserve 3–5 tools that can be used as guide pins such as, for example, pin punches of 5–8 mm in diameter

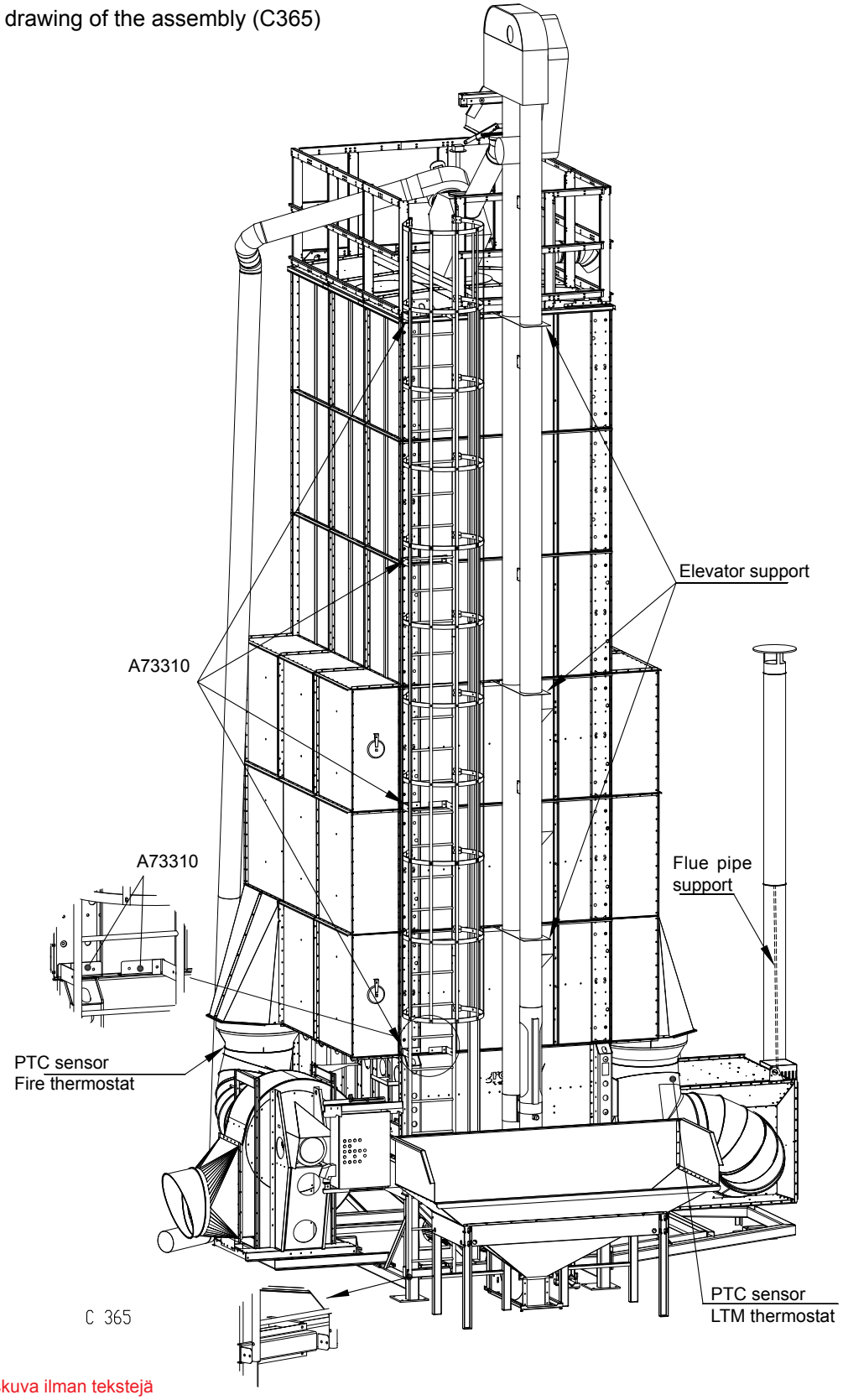
Provide all the seams with sealing band.
Note! If you wish to stack several sections, and lift them on top of the base in one go, use the separate lifting lugs (501010). Refer to the erecting instructions 408076 for detailed instructions. Attach the lifting lug by eight M8 bolts. Brace the lugs by fixing battens of 50x100 by the two holes to support the lugs so that the section end will not bend. Use the same lugs for lifting the top tanks.

The dryer can be assembled from larger sub-assemblies. All the drying sections and the top tanks can be lifted into place using the robust lugs on the top. An example: the top tanks and the top tank cover with handrails can be assembled while the section is still on the ground. Tighten all the bolts – use M10 bolts for fixing the vertical supports. Lift this large sub-assembly onto the top of the base.

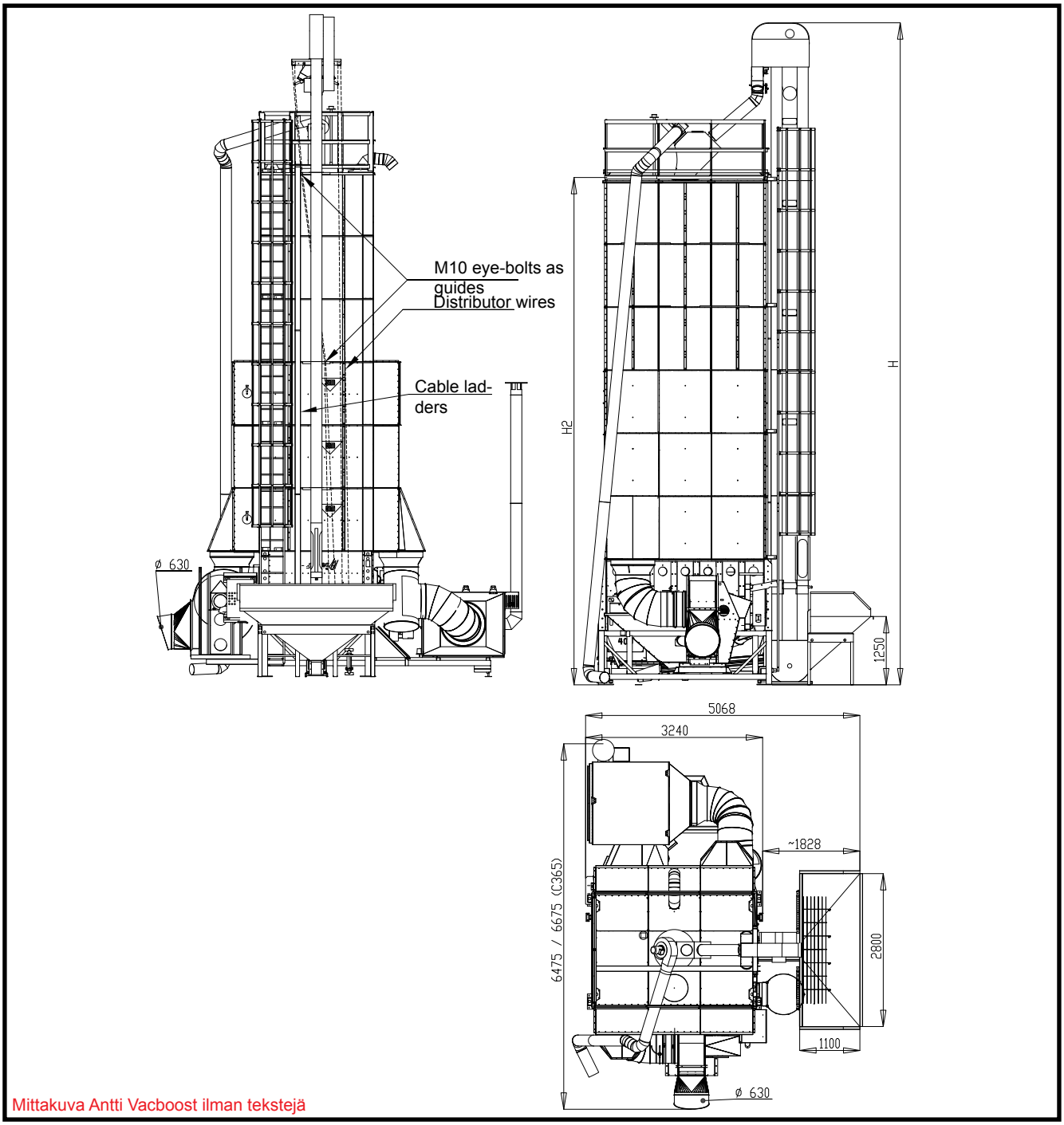
NOTE!
The total weight of the sub-assembly is several tonnes, so a heavy crane is required. Verify the load-bearing capacity of the soil, before the lifting.

Principle drawings of different dryer types with accessories

Principle drawing of the assembly (C365)



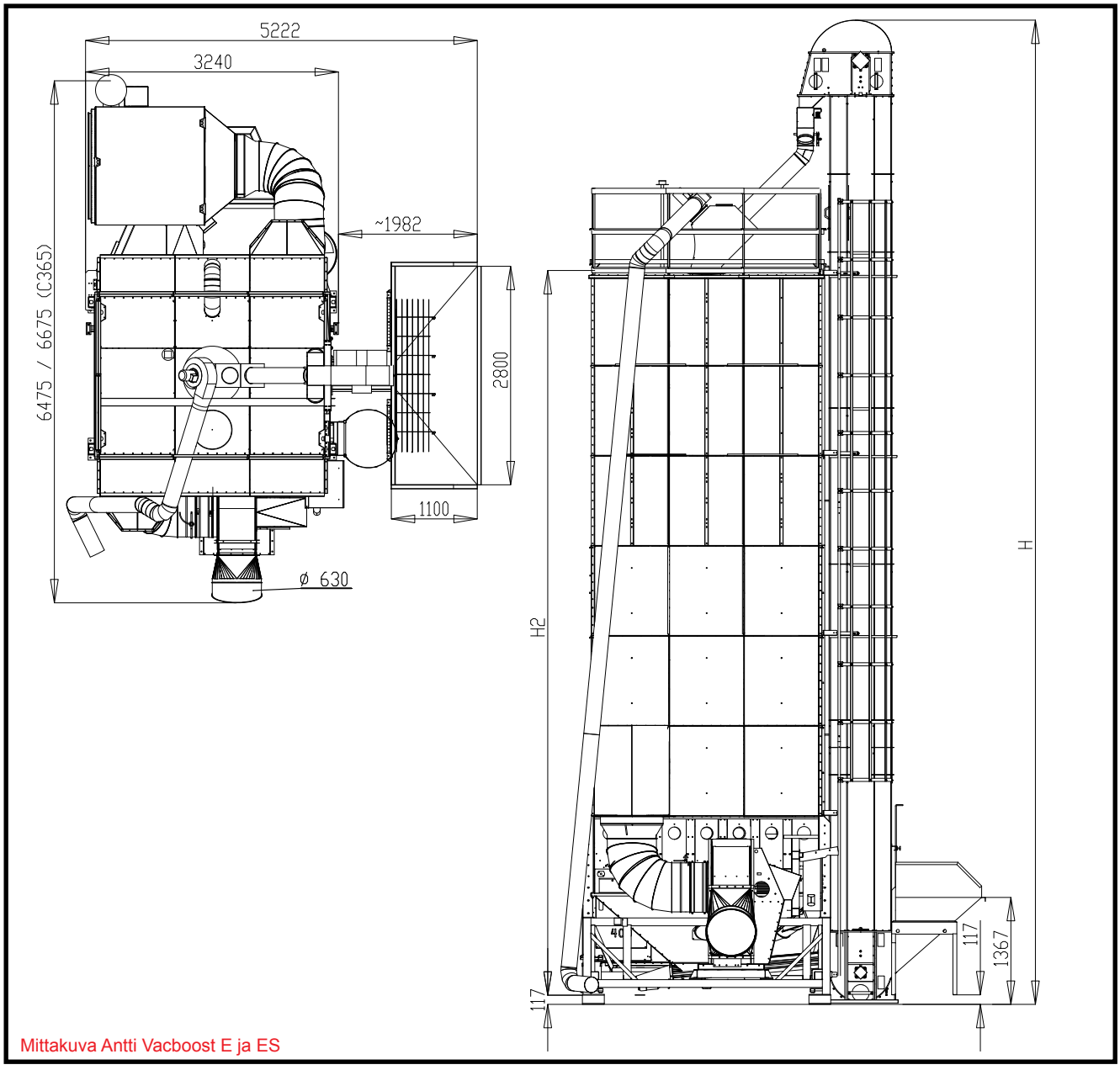
C365_yleiskuva ilman tekstejä



Mittakuva Antti Vacboost ilman tekstejä

Antti Vacboost

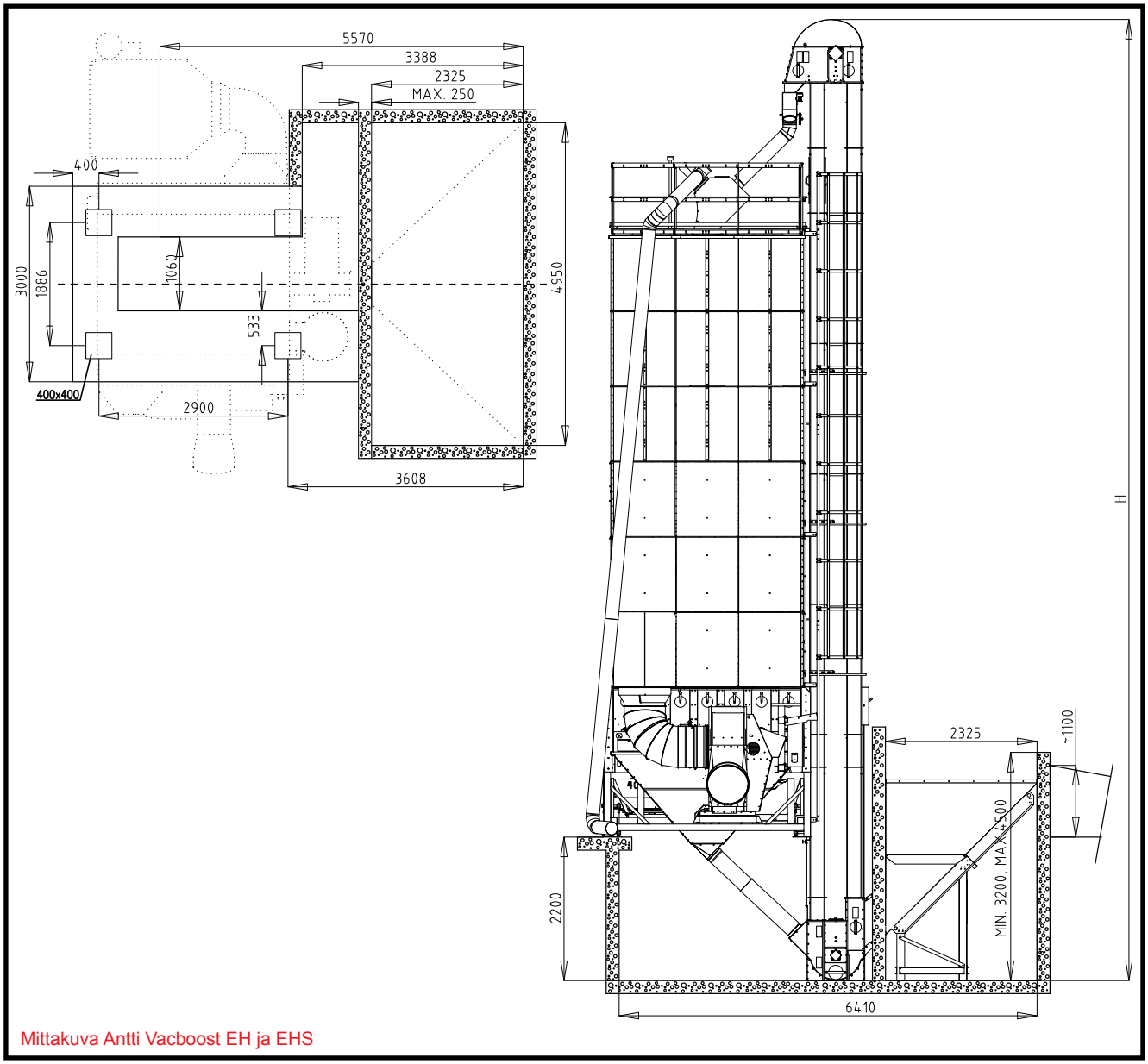
Model	H mm	H2 mm	Elevator t/h	Elevator kW	Fuse size A	
					Pre-cleaner 0,75 kW	Pre-cleaner 2,2 kW
C205	9100	5840	45	3	25	25
C255	10100	6990	45	3	25	32
C320	11100	8150	50	4	25	32
C365	12100	9300	50	4	50	50



Mittakuva Antti Vacboost E ja ES

Antti Vacboost E / ES

Model	H mm	H2 mm	Elevator t/h	Elevator kW	Fuse size A	
					Pre-cleaner 0,75 kW	Pre-cleaner 2,2 kW
C320E	11700	8150	60	4	25	32
C365E	12700	9300	60	4	50	50
C205ES	12700	5840	60	4	25	25
C255ES	13700	6990	60	4	25	32
C320ES	15700	8150	60	5,5	32	32
C365ES	16700	9300	60	5,5	50	50

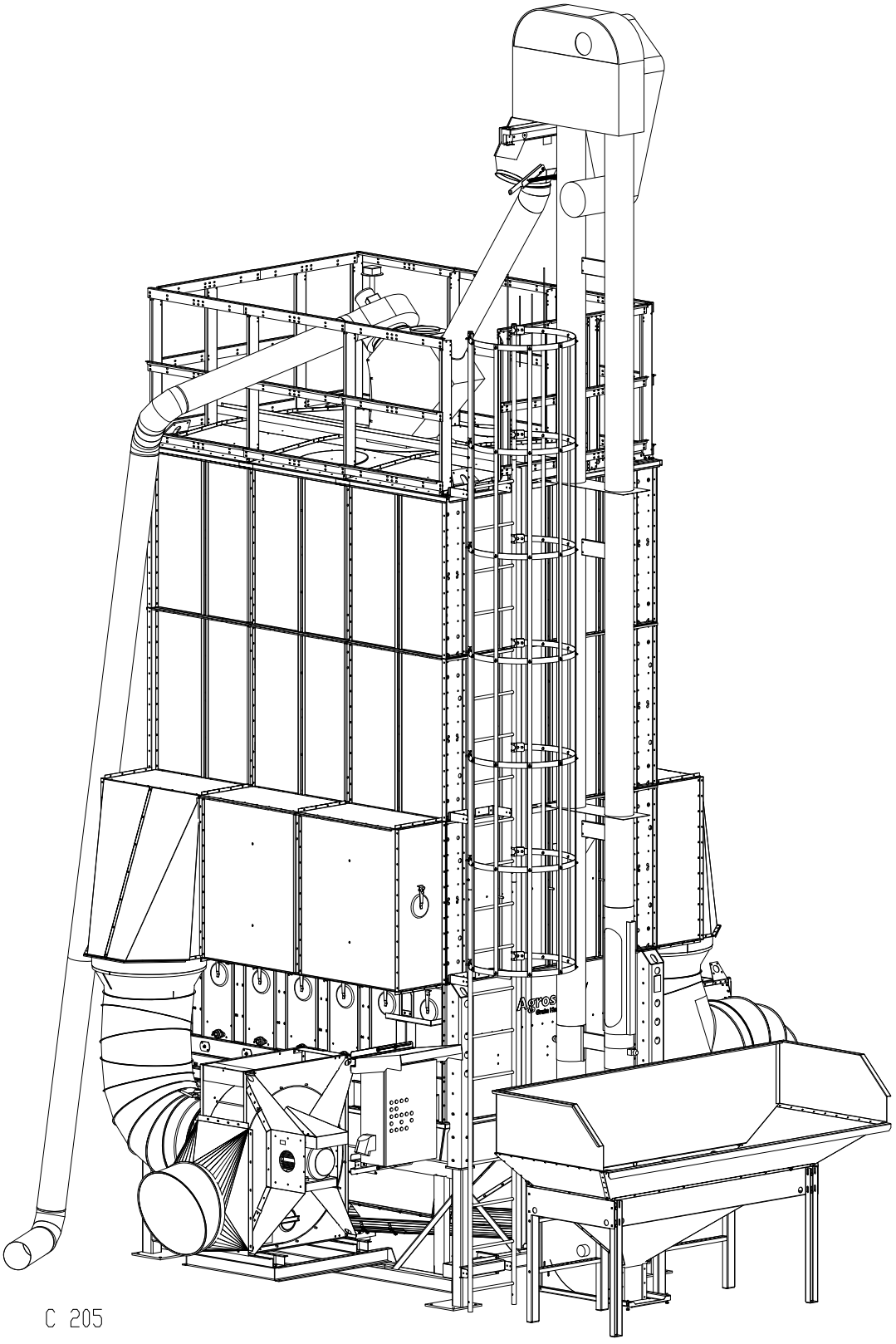


Mittakuva Antti Vacboost EH ja EHS

Antti Vacboost EH / EHS

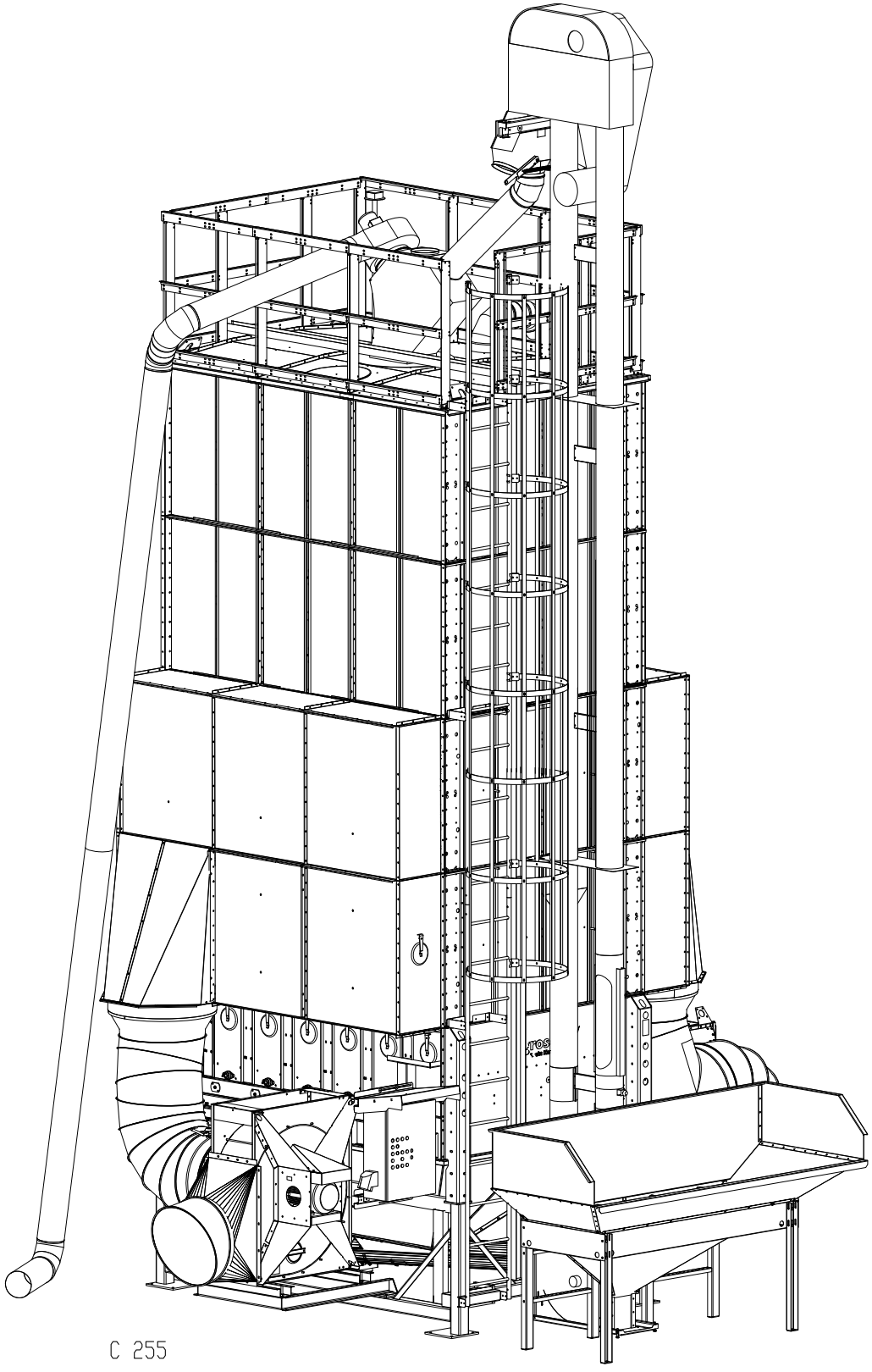
Model	H mm	H2 mm	Elevator t/h	Elevator kW	Fuse size A	
					Pre-cleaner 0,75 kW	Pre-cleaner 2,2 kW
C205EH	11700	5840	60	4	25	32
C255EH	12700	6990	60	4	25	32
C320EH	13700	8150	80	5,5	25	32
C365EH	14700	9300	80	5,5	50	50
C205EHS	14700	5840	60	4	25	25
C255EHS	16700	6990	60	5,5	25	32
C320EHS	17700	8150	80	7,5	32	32
C365EHS	18700	9300	80	7,5	50	50

C 205



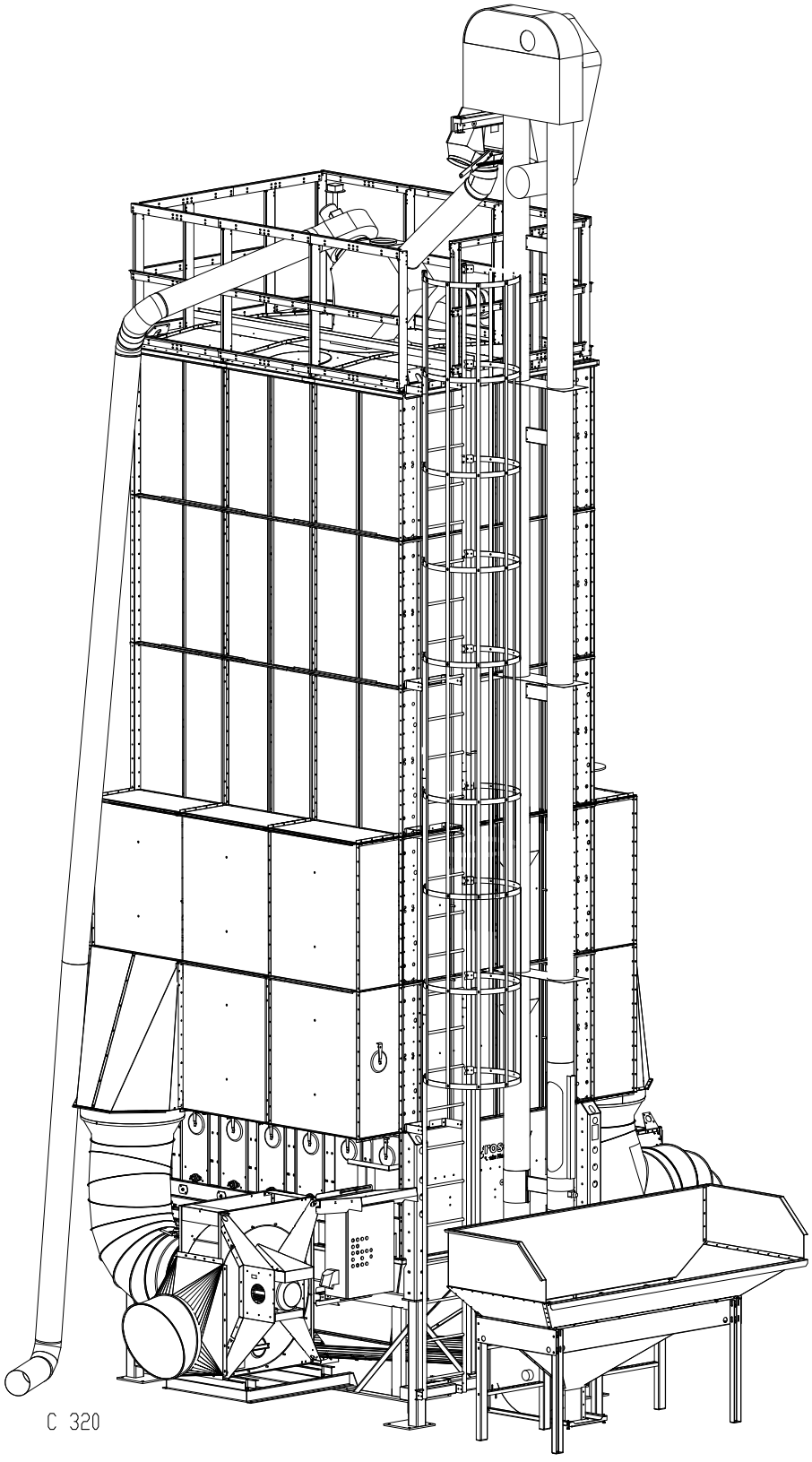
C 205_malli

C 255



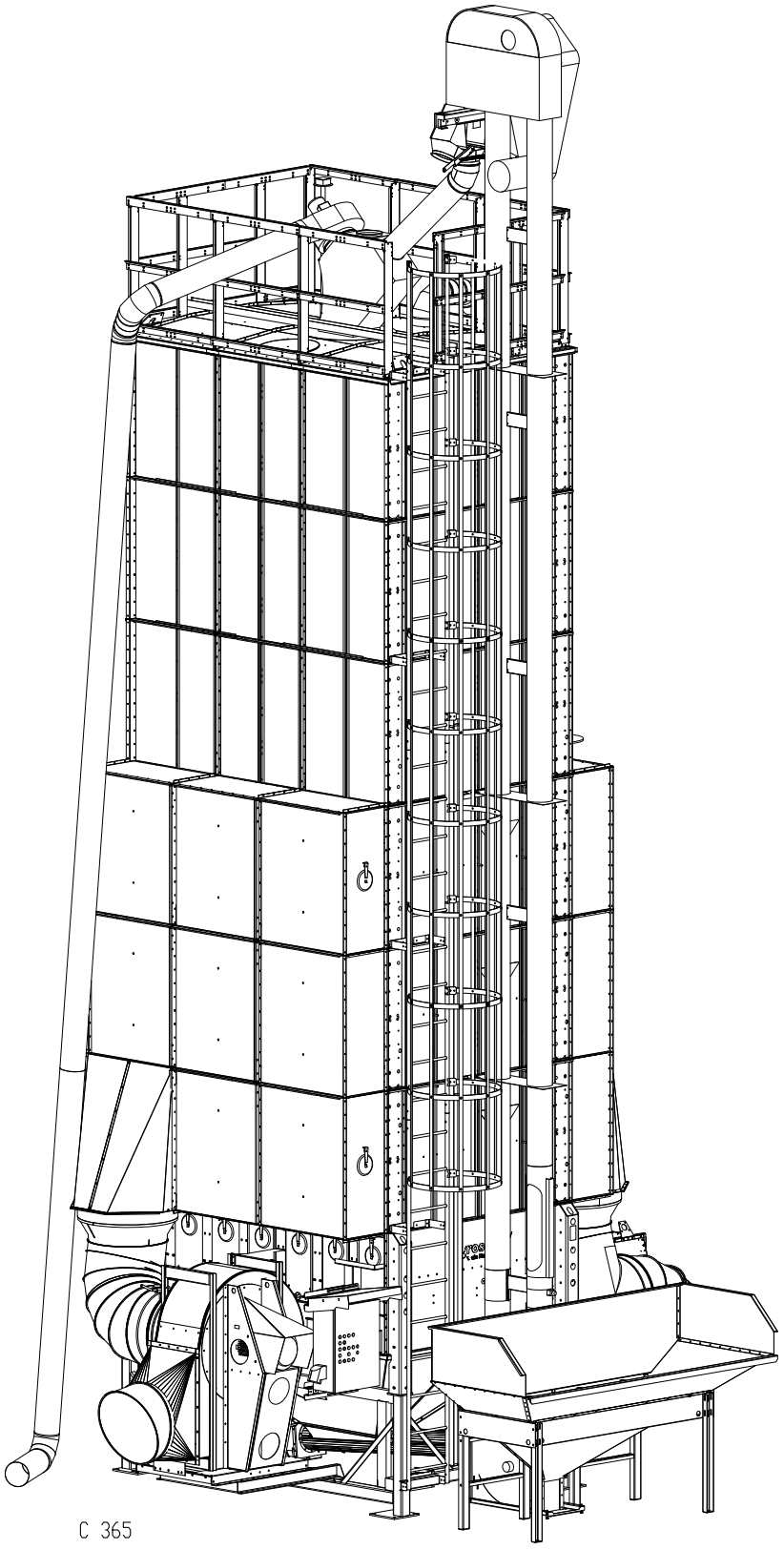
C 255_malli

C 320

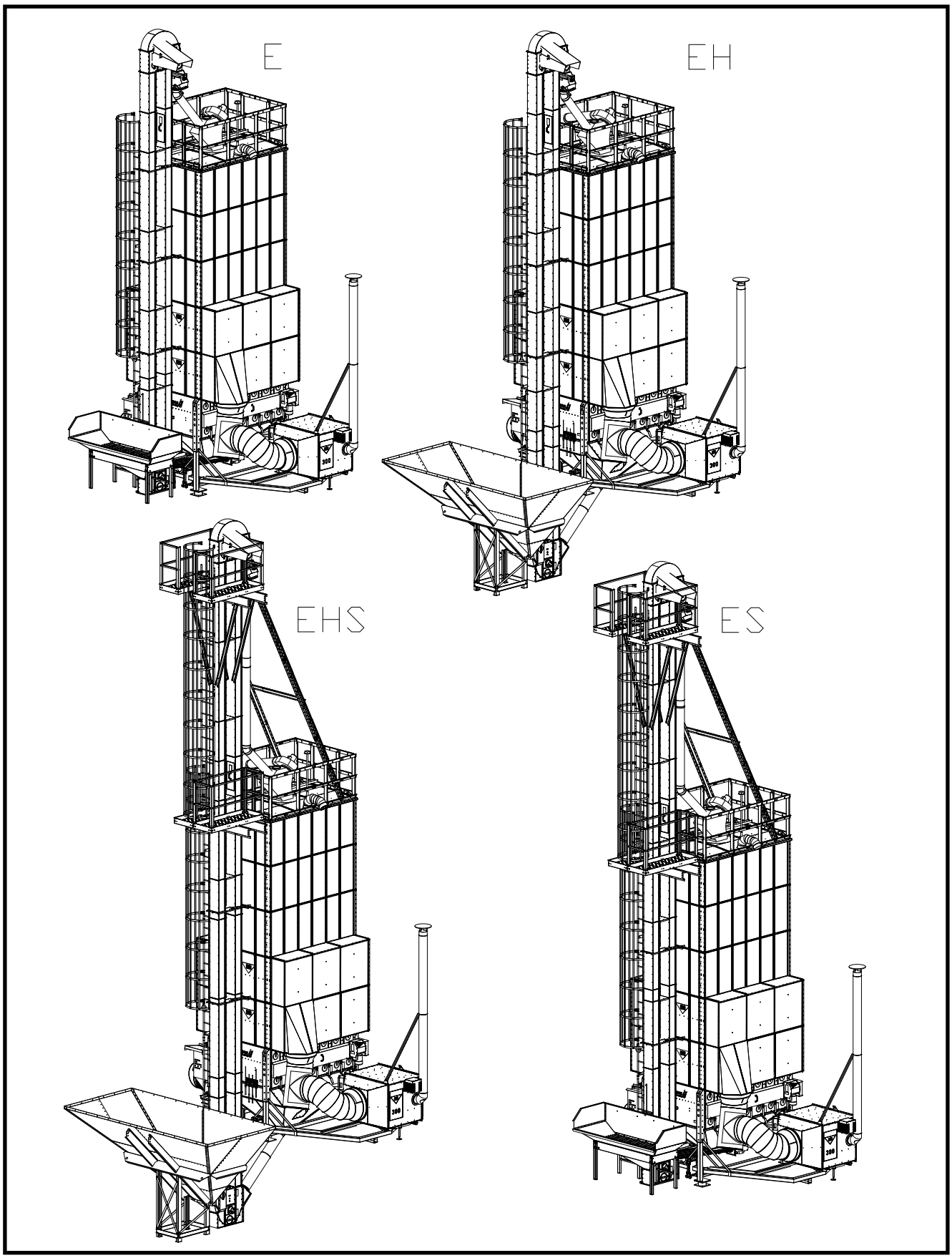


C 320_malli

C 365



C 365_malli


E
EH
EHS
ES

Base with frame

Lift the base with frame into place on the concreted foundation, that is fitted with bond plates. Bring the base into the level position.
To ensure the proper operation of the dryer, use a water level to verify that the top surface of the base is absolutely **level** before continuing the installation work.
To ensure that the unit will remain upright even if the wind strong, attach its legs by welding to the bond plates in the concreted foundation or fix them by means of expansion anchors (4 pcs./M16).

Sections, air channel ends

The sections are delivered ready-assembled including the air channel ends. The air channel ends of the export model are delivered in parts. The air channel ends can be assembled and attached to the sections while still on the ground. Provide each joint with a sealing strip.
While lifting the sections into place, make sure that they come in the right way. The inlet side of the sections shall come on the trough-rod side of the base.

For proper operation of the dryer it is essential that the air inside the triangular channels of the sections flows in the correct direction: the open end of the triangular channel halves shall be come on the section's inlet side (facing to the heater).

Before lifting the lowest section into place, affix self-adhesive sealing strips to the upper surfaces of the base. Place the strip on the inner edge of the horizontal contact surfaces of the base and the section. Provide all the joints with seals.
When inserting bolts into the holes in the joints between the sections, put also the fixing irons for the ladder A73310 into place. See their installation position in the principle drawings for the dryer. Place the irons at every other joint.
Use M10x20 bolts for joining together the corner reinforcement legs of the sections and the top tanks.

NOTE! **Remove the lifting lugs (501010) as soon as the sections are in place!**

Top tanks and cover with handrails

Place a sealing strip on the inner edge of the horizontal contact surfaces of the top tank. Provide all the joints with seals.
When inserting bolts into the holes in the top tank joints, put also the fixing irons for the ladder A73310 into place. See their installation position in the principle drawings for the dryer. Place the irons at every other joint.. Continues following the distribution on the section. Use M10x20 bolts for joining together the corner reinforcement legs of the sections and the top tanks.

The top tanks and the sections can all be joined together while still on the ground, and lifted up in one go. NOTE! Observe the weight.

Installing the upper limit sensor
(Capacitive, adjustable)

The delivery of the dryer machinery includes a capacitive level guard with an adjustable rod.

Install the upper limit sensor in the bracket located in the dryer's top. Install the sensor sufficiently low to prevent the elevator from congesting during the first times of use. The correct height of the sensor is about 60 cm from the top. Follow the dryer's filling rate during the first filling and drying rounds. You must search out the correct height for the upper limit sensor, because in practice, it varies. Observe that the grain mass expands in the beginning of the drying phase. Therefore, some space must be reserved for the pre-cleaner. Fix the height position of the sensor using the wing screw.

Over time, the sensor's head may get dirty and start transmitting wrong data. Due to the above reason, the sensor head should be cleaned from time to time.

Installing the elevator

Assemble the elevator base at the side of the frame, and bring it upright. The standard A-model elevators for the mobile dryer are delivered ready-assembled.
An elevator that differs from the standard configuration, shall be assembled according to the instructions 408010 or 408011.

NOTE! An elevator, that lies on the ground, must not be lifted only by its centre point, but by two points that are sufficiently far apart.
Lift the elevator into place, and as required, adjust the height of its base after having attached the conversion part to the elevator.

The assembly instructions for the service platforms and the support of the ES and EHS type elevators are included in the instructions for the E-series elevator 408010.

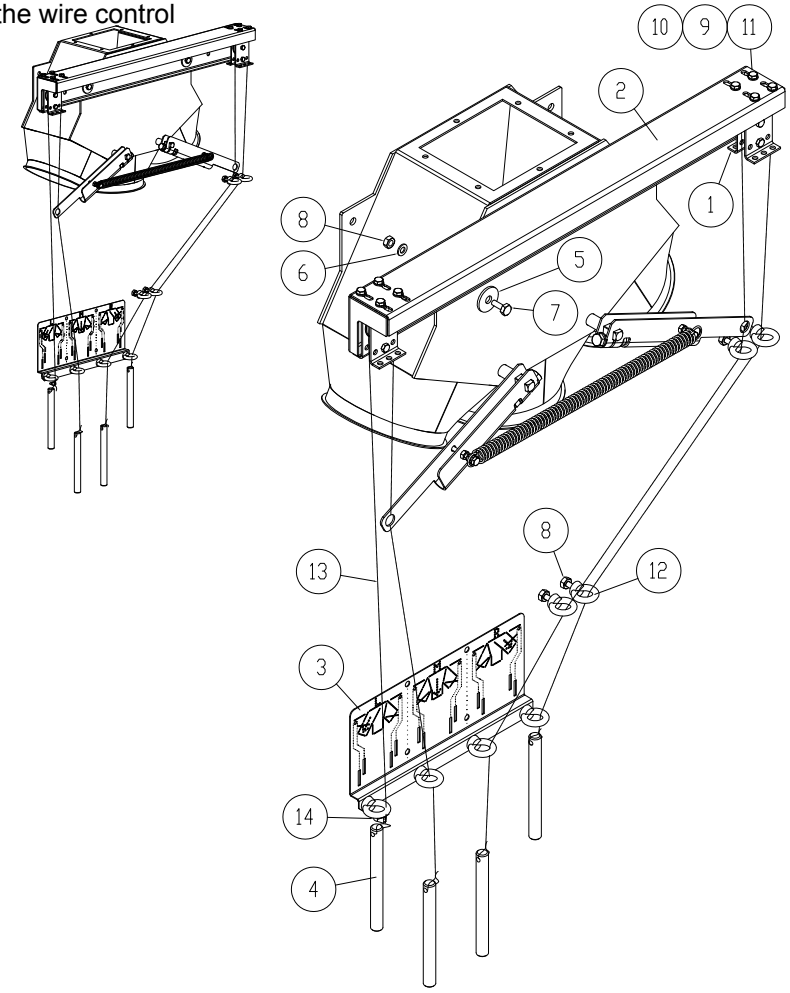
Large bolt-assembled hopper

Assembly in accordance with the instructions 408110.

Wire control of the 3-way divider and the circulation pipes

The standard delivery includes a manually operated 3-way divider, which can be controlled from the ground.

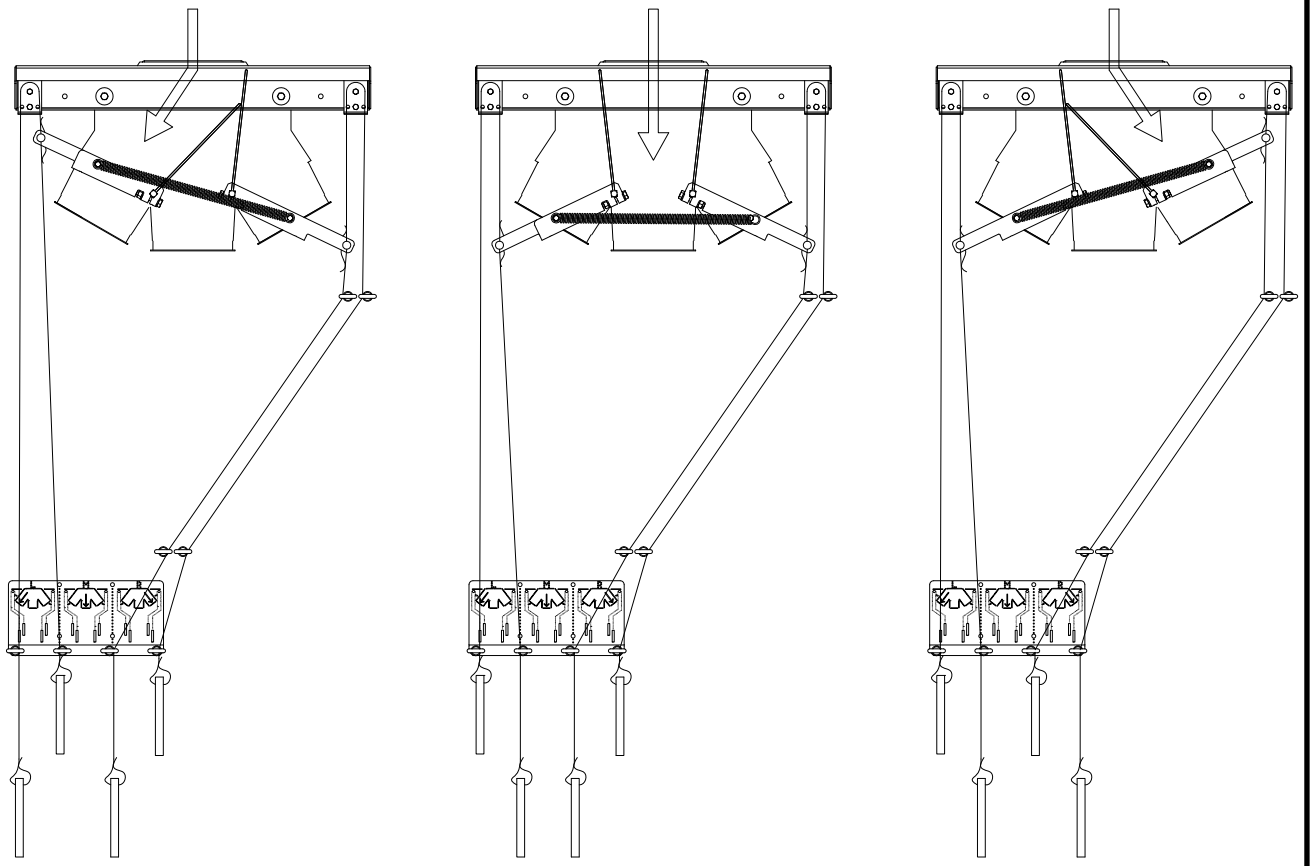
Spare parts drawing of the wire control



JAKAJAN VAIJERIKÄYTTÖ

Part	Item	Denomination	Drawing No.	Pcs.	Weight
1	A73992	PULLEY D50 M12	A73992	2	0,54
2	A73993	BEARER FOR THE DIVIDER'S WIRE CONTROL M12	A73993	1	5,48
3	A73994	WIRE CONTROL FOR THE DIVIDER M12	A73994	1	1,07
4	42426	SHUTTER FLAP FOR THE GRAIN PIPE	42426	4	0,5
5	111561	WASHER ZN 14/45X4 DIN440R		2	
6	111550	WASHER ZN M10 DIN 125		2	
7	102210	HEX BOLT ZN 10x25 DIN933		2	
8	110560	NUT M10 DIN 934		10	
9	111540	WASHER ZN M8 DIN 125		8	
10	101810	HEX BOLT ZN 8x16 DIN933		8	
11	110540	NUT M8 DIN 934		8	
12	107807	EYE-BOLT LIFT M10x18 DIN580		8	
13	114067	PLASTIC COATED WIRE D3/D5 MM		59,2	
14	114055	WIRE LOCK D5		8	

Operating principle of the wire control



A73996

Attach the divider to the conversion part of the elevator, and install the bearer for the wire control pulleys at the side of the divider. Connect the wires to the control levers of the divider, and on one side, route the wires directly to the lower control unit, and on the other side, route them via the eyebolts to the other control lever, avoiding too sharp angles. See drawing: "Operating principle of the wire control"

Install the circulation pipes between the elevator and the dryer. Make sure that the fall angle of the piping is 45° (1:1).

Air piping

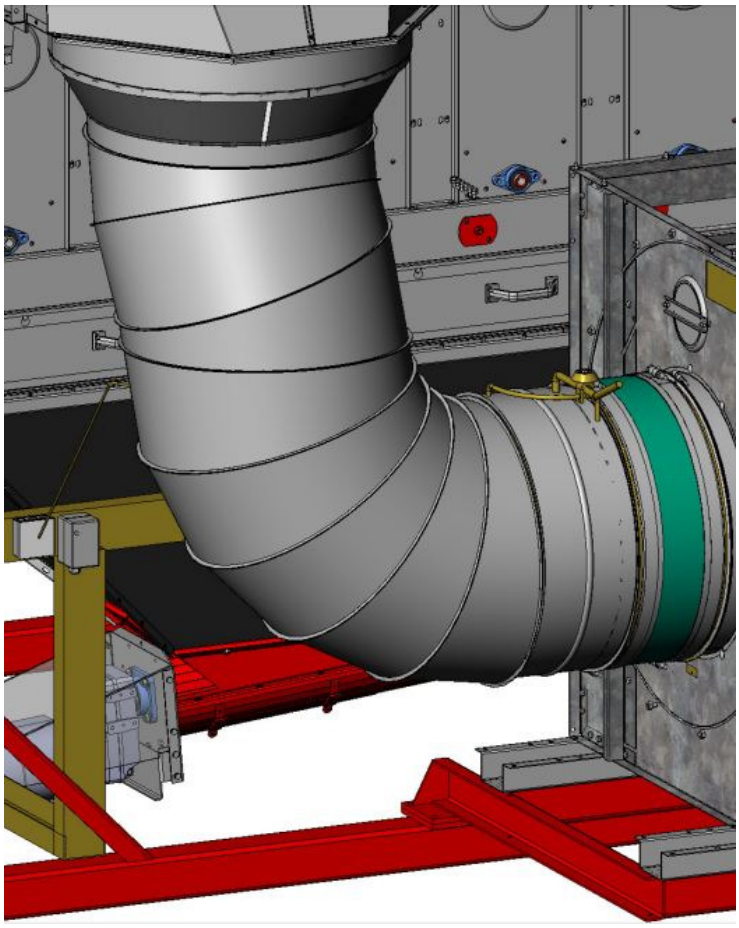
WARNING! Foreign particles inside the heater are a fire hazard!

The outlet air from the dryer is often dusty and contains debris, in particular at the final phase of the drying process. Therefore, you should always try to route the outlet air pipe to the opposite side of the dryer building to the inlet of suction air to the dryer heater.

WARNING! Debris in the suction air of the heater constitutes a fire hazard!

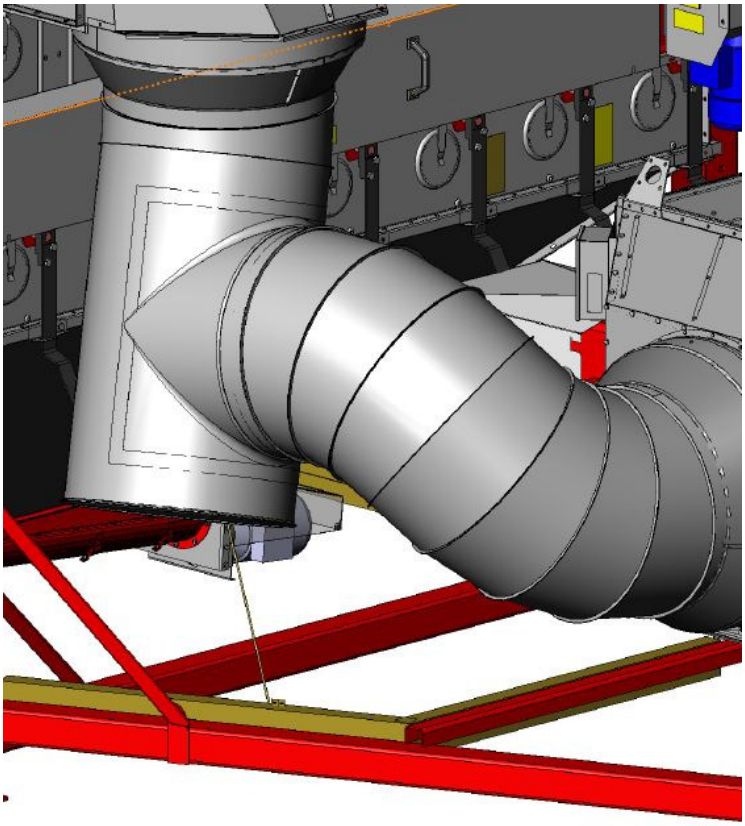
The following drawings present the installation of the air pipes:

Blow pipes C205, C255, C320



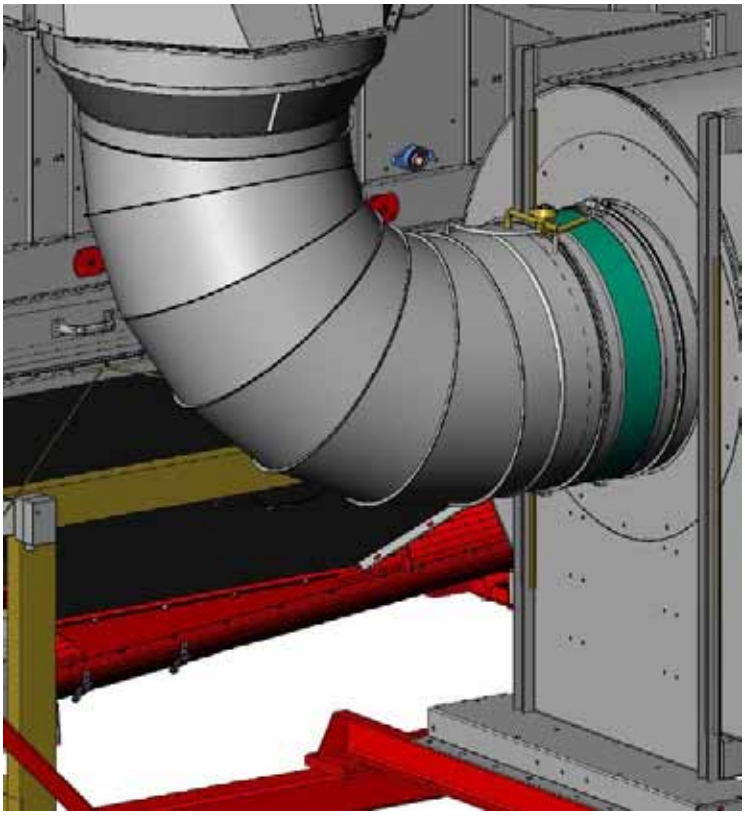
C205 C255 C320 puhallin putket

Heater pipes C205, C255, C320



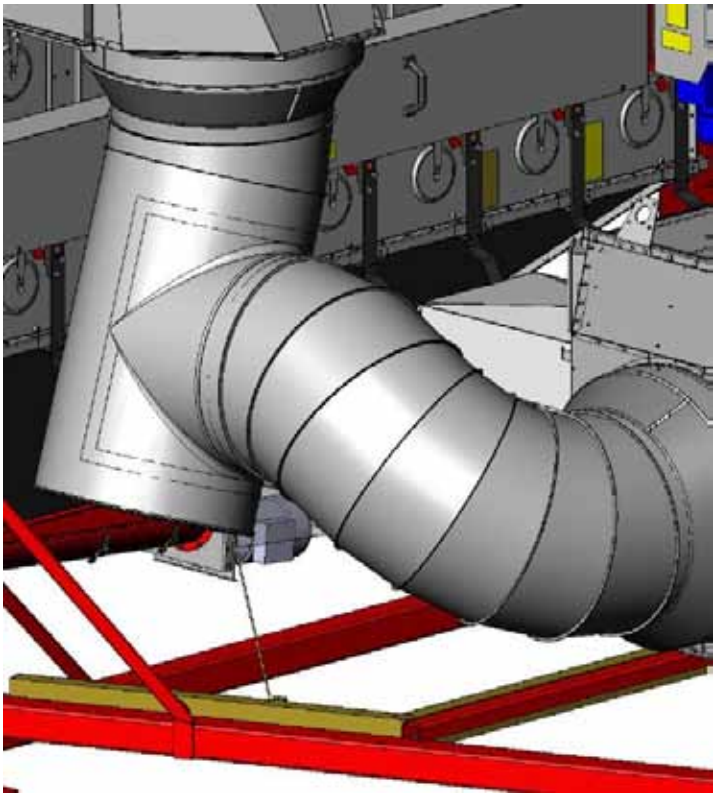
C205 C255 C320 uunin putket

Blow pipes C365



C365 puhallin putket

Heater pipes C365



C365 uunin putket

Fuel pipes

The mobile dryer has a single-pipe fuel system, so there is no need to route more than one pipe from the fuel tank to the fuel filter located at the side of the heater. The "excess" fuel, returning from the burner, recirculates to the burner, and additionally, the required fuel flows through the filter to the Tigerloop.

Installing the debris piping for the pre-cleaner

NOTE! The debris piping must always be routed to the opposite side of the dryer to the inlet air opening of the dryer heater.
Debris in the inlet air of the dryer heater is a fire hazard!

Route down the debris piping for the pre-cleaner on the side of the dryer.
Install the debris piping using the parts intended for this purpose: The ventilation pipes D200 and the elbows of 45 and 90 degrees. Support the piping at every 3–4 metres using, for example, perforated steel band.

It pays to route the debris pipe of the pre-cleaner to a cyclone (option) that separates the dust and debris from the air. This helps keep the surroundings of the dryer clean and tidy.
The dust cyclones can be purchased from Antti-Teollisuus

Electric installations

After having assembled the entire machinery, install last the vertical cable ladder and the wiring. Install the cable ladder on the same side with the elevator, next to the ladder. Position the cable ladder in the lateral direction at the cable ladder on the top. Measure the distance to the edge, and transfer this measure to the lower part. Install the cable ladders in full length from the bottom to the top. Cut off the uppermost cable ladder at the height of the dryer's top using side-cutting pliers or an angle grinder.

The conductors for the following units are routed from the upper part of the dryer:

- Elevator
- Pre-cleaner
- Level guard

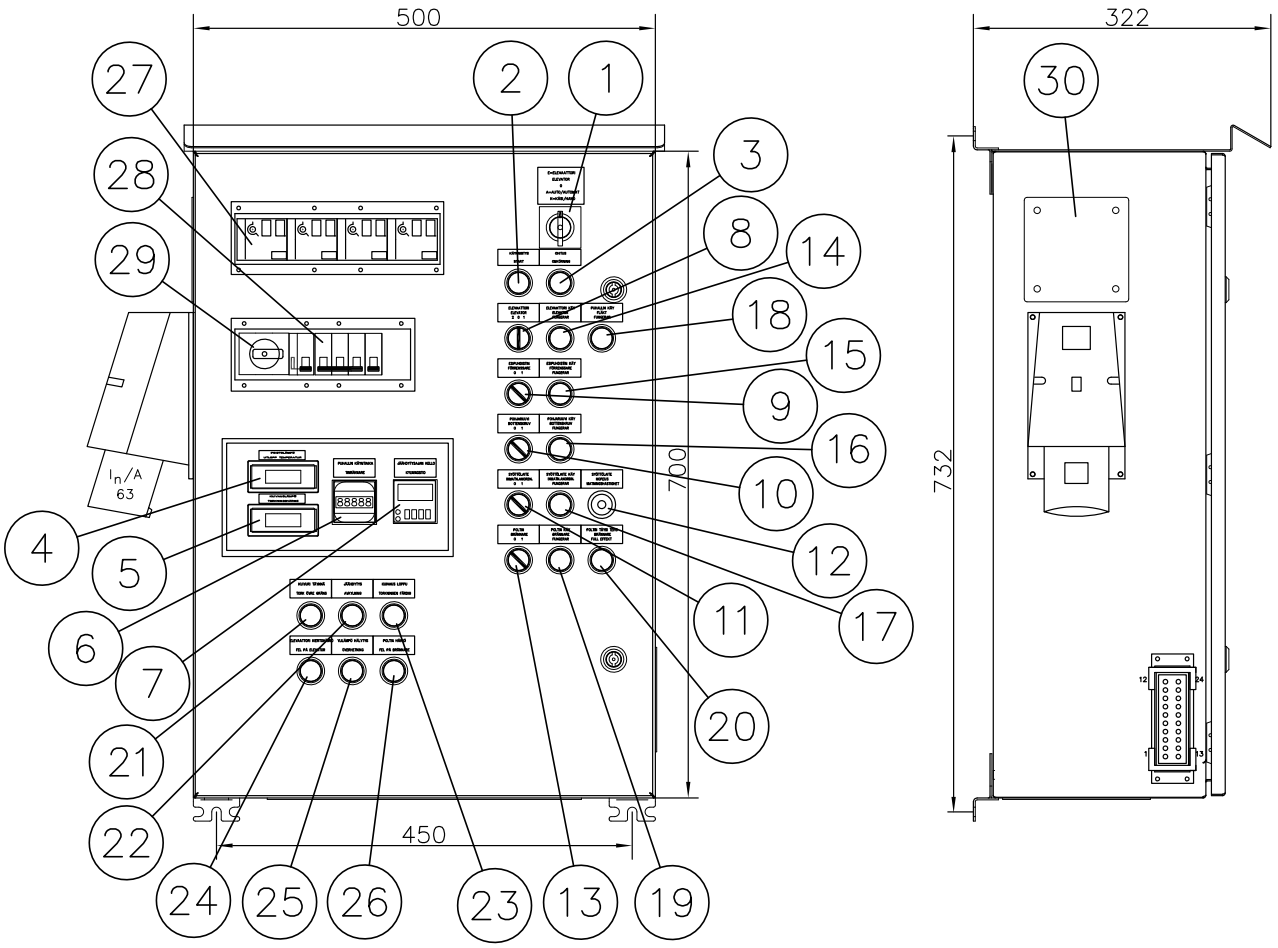
Route the conductors to the electric centre, and connect them to the inlet as marked in the conductor Attach the conductors to the cable ladders using cable ties. You can "hide" the excess length of the conductor by folding it inside the trough.

Install the PTC sensor and the LTM thermostat to the air pipe coming from the heater. Install the PTC sensor and the fire thermostat in the pipe that goes to the suction fan on the outlet side.

- Install the thermostat and the sensor on the inlet side. The sensors must not be in direct visual contact with the rear part of the combustion chamber so as to prevent the red glow of the combustion chamber from interfering with the values measured by the thermostats.
- SEE DRAWING! (page 8)

- The electric conductors must be at a distance of at least 50 mm from the surface of the heating pipe to avoid the risk of overheating.

1	Operation switch	11	Feeder switch	21	Signal light for level guard
2	Start button	12	Adjustment of feeder	22	Signal light for cooling
3	Bypass button	13	Burner switch	23	Signal light "drying finished"
4	Outlet air temperature	14	Signal light for elevator	24	Signal light "circulation failure"
5	Inlet air temperature	15	Signal light for pre-cleaner	25	Signal light "overheating"
6	Operating hour counter	16	Signal light for bottom screw	26	Signal light "burner failure"
7	Cooling timer	17	Signal light for feeder	27	Protective switches for motor
8	Elevator switch	18	Signal light for blower	28	Circuit breaker
9	Elevator switch	19	Signal light for the burner	29	Main switch
10	Bottom screw switch	20	Signal light for auxiliary nozzle	30	Blower, retro-fitted



The electricity supply to the grain dryer – like to any other building on the farm – must be protected with a fault current switch
in accordance with the valid legislation.

It is recommended that the electricity supply be protected by means of proper overvoltage protection.

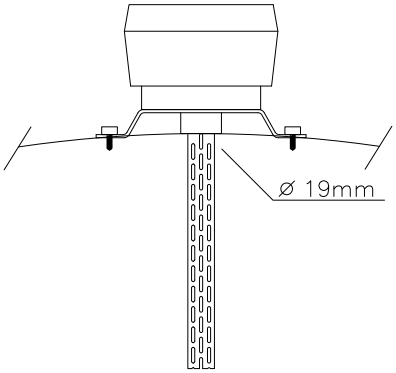
1. Installation

1.1 Installing the LTM thermostat

The LTM thermostat is a double-thermostat, which includes a temperature limiter and the after-cooling system for the heater.

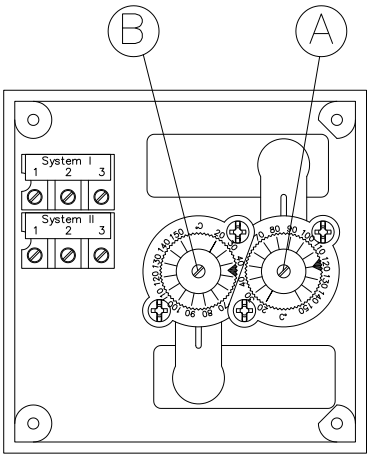
The LTM thermostat is installed in the inlet air pipe, at a distance of 0.5–2 m from the heater. Drill a hole of 19 mm for the thermostat in the pipe, press the thermostat into the hole and fix it with screws.

SEE THE DRAWING ON PAGE 8 FOR THE INSTALLATION PLACE



Set the temperature limiter 20 °C above the maximum allowed operating temperature of the heater. For example: if the maximum allowed operating temperature of the heater is100 °C, set the temperature limiter to 120 °C. The after-cooling system shall always be set to 45 °C.

A – Temperature limiter (LIMIT)
B – After-cooling (FAN)



1.2 Installing the fire thermostat

Attach the thermostat unit (1) to the wall according to the drawing.

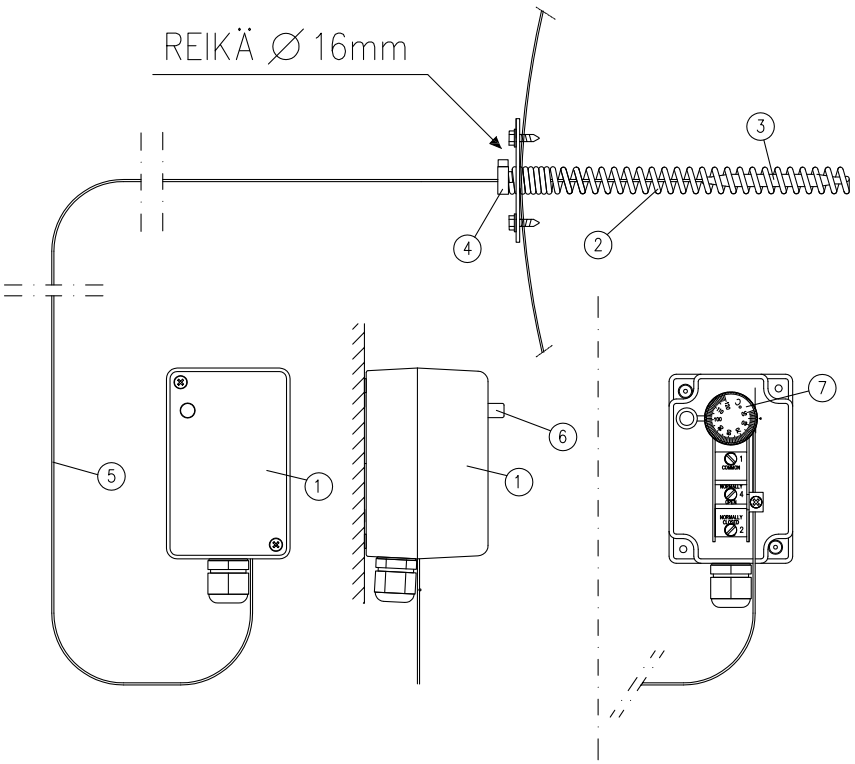
Drill a hole of 16 mm for the sensor holder (2) in the air pipe. Fix the holder to the air pipe using screws.

Push the feeler (3) of the thermostat's capillary pipe (5) into the sensor's holder, and lock it by clamping the locking collar (4) on the capillary pipe and twisting it into the holder.

Set the operating temperature via the adjustment wheel (7) inside the fire thermostat. Set the operating temperature of the fire thermostat 10°C higher than the maximum temperature of the outlet air, however, to at least 50°C.

Ensure that the fire thermostat is active by depressing the reset button (6).

Connect the fire thermostat to the system in accordance with the wiring diagram.



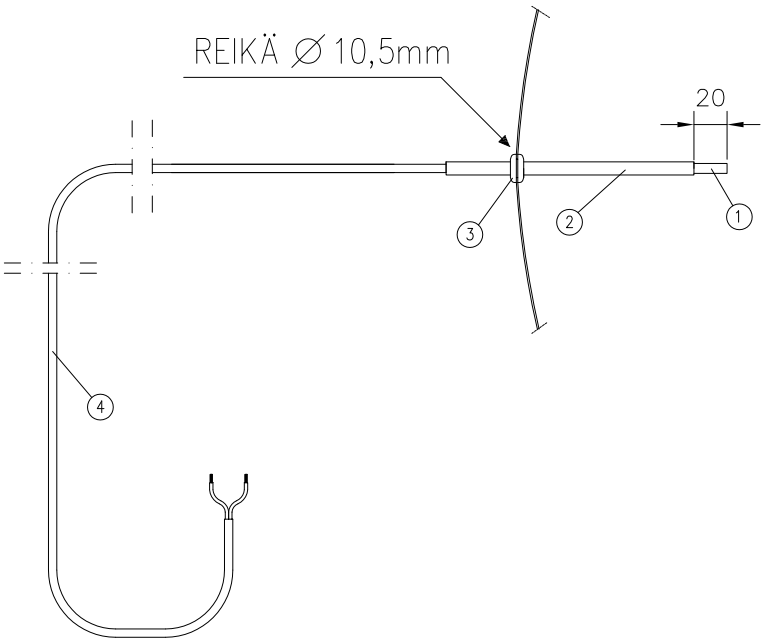
1.3 Installing the temperature sensors

Pull the PTC sensor (1) with its conductors (4) through the nylon pipe (2) so that the metal part of the sensor will stick out about 20 mm from the nylon pipe.

Drill a hole of 10.5 mm in the air pipe, and install in it the lead-through gasket (3).

Push the nylon pipe with the sensor through the lead-through gasket into the air pipe, about 50 mm of the nylon pipe will be left out.

SEE THE DRAWING ON PAGE 8

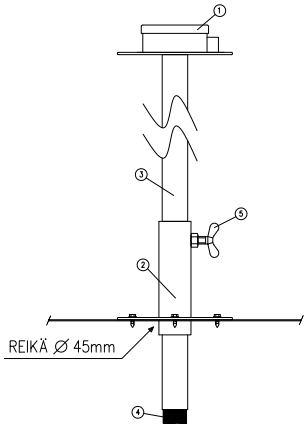


1.4 Installing the upper limit sensor

Upper limit
Drill a hole of 45 mm in the top of the dryer or the storage silo, and install in it the holder for the sensor pipe (2).

Push the sensor pipe (3) into the grain space so that the feeler (4) comes at the desired height of the upper limit. Lock the sensor pipe in position by tightening the locking bolt (3).

Connect the upper limit sensor to the system in the connecting box (1) in accordance with the wiring diagram.



2. STARTING UP

Particular caution must be exercised during the start-up and the test run. Only an authorised electrician is allowed to change the settings of the protective devices. Always switch off the decoupling switch of the device or the mains switch before carrying out any tasks that require the protective covers of the devices to be opened. Only an authorised electrician is allowed to carry out tasks that require that the electric connections be changed or the connecting boxes be opened.

Always before testing the machinery, check visually that all the installations have been properly completed, and all the protective covers are in place and all the cover plates are closed. Also the start-up inspection according to the regulations for the electro-technical industry must have been performed, where applicable.

Also check before the test run that the current values for the motor protection switches and the thermo-relays match the values given in the nameplates of the motors. The blower outlets are equipped with thermo-relays. Their current values shall be set to 0.58 times the rated current mentioned in the motor's nameplate. The other motor outlets have motor protection switches. Their current value shall be set to the value mentioned in the motor's nameplate.

The blower outlet is equipped with a star-delta starter. Set the time-relay of the star-delta starter as instructed in the drawing delivered with the wiring diagrams.
The outlets of 5.5 kW and above – except for the ones for the blowers – are equipped with attenuators. Also check the settings of the attenuated starter(s) in the drawing.

2.1 Elevator

Check the installation and connection of the underspeed guard for the elevator. If the underspeed guard is electronic, check also that the distance between the guard's sensor and the rotator plate is correct. If the elevator is equipped with a back rotation preventer, it must be removed before the test run.

Switch the selector switch to position E. Switch the elevator switch to position 1. The elevator should now start. Check and, as required, change the direction of rotation of the elevator. Stop the elevator by turning the elevator switch to position 0.

Check the operation of the electronic underspeed guard by removing the connecting box of the guard's sensor. Start the elevator by turning the elevator switch to position 1. The elevator should first start and then stop after about 8 seconds of operation.

Check the operation of the dryer's upper limit sensor by turning the elevator's selector switch to position 2. The elevator should start. Touch the dryer's upper limit sensor by your hand. The elevator should stop.

2.2 Pre-cleaner

Turn the selector switch to position E. Turn the pre-cleaner switch to position 1. Check and, as required, change the direction of rotation of the pre-cleaner.

2.3 Feeder

To test run the feeder, first switch on the elevator and the bottom screw. Turn the feeder switch to position 1. The feeder should start. The direction of rotation of the feeder motor has no significance. If the feeder is equipped with a frequency converter controlled rotation speed adjustment, check also its operation. Turn the potentiometer of the feeder to position 1. The motor should now rotate at the minimum speed – 25 Hz. Note! The motor must not stop! Turn the potentiometer of the feeder to position 10. The motor should now rotate at the maximum speed – 85Hz. If the potentiometer operates in the wrong way, change with one another the conductors connected to the potentiometer's terminals 1 and 2.

2.4 Blower

Turn the selector switch to position K. The blower should start. Check, and as required, change the direction of rotation of the motor.

2.5 Burner

Only an authorised oil burner fitter is allowed to start up the burner. Before testing the oil burner, check that the nozzles installed in it are the ones mentioned in the heater's manual. The maximum allowed oil flow, mentioned in the heater's nameplate, must not be exceeded.

Sometimes it is necessary to check the direction of rotation of the blower before starting the blower. To check the

direction of rotation, do the following: Make sure that the decoupling switch of the burner is switched on. Turn the switch on the burner to position 0. Start the blower by turning the selector switch to position K. Turn the burner switch in the electric centre to position 1. Then turn the switch on the burner to position 1. Wait until the burner motor starts. Check the direction of rotation and stop the burner immediately by turning the switch on the burner to position 0.

Mobile dryer model	Heater model	Burner	Max. oil flow kg/h	Nozzle pressure bar	Nozzle 1	Nozzle 2	1-air cam wheel III	2-air cam wheel I	2- magn. valve cam wheel V	Adjust-ment ring
C205	200	KP-26H2	15,3	10	3 gal 80°	1 gal 80°	30°	50°		
C255/C320	300	KP-26H2	27,8	12,5	4,5 gal 80°	2 gal 80°	32°	52°	40°	50 mm
C365	400	KP-50H	37,1	13	5,5 gal 80°	3 gal 80°	20°	38°	29°	5
C365	500	KP-50H	46,4	13,5	6,5 gal 80°	4 gal 80°				

To reset a failure in the burner, press down the burner relay button with illuminated malfunction light at the side of the burner.

2.6 LTM thermostat

Start the blower and the burner in accordance with the instructions above. Allow the temperature to rise to 80 °C. Open the LTM thermostat's box. Turn the setting of the LTM thermostat's overheat protection lower than the temperature of the inlet air. The burner shall now stop, and the blower shall continue to run. As soon as the temperature of the inlet air drops below 45 °C, the burner shall restart. After having finished the test, return the setting of the overheat protection to the value mentioned above.

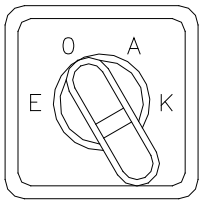
3. Functions of the control centre

3.1 Switches and buttons

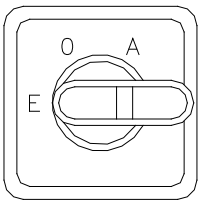
3.1.1 Operation switch

The dryer's operating mode is selected using the switch (1). Irrespective of the position of the selector switch, the following safety features are active:
The feeder can only be started, while the elevator and the bottom screw are running. The blower remains switched on until the inlet air temperature drops below 45 °C.

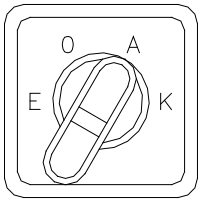
Positions:



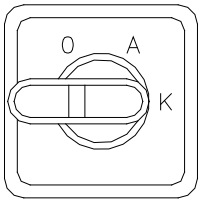
Position 0
The appliances are standing still.
Note! Turning the switch to position 0 during the drying phase will not stop the machinery, if the burner is running, and the inlet air temperature is higher than 45 ºC.



Position E
Enables the appliances in the filling and emptying chain of the dryer to be operated. If the switch is in this position, you can, for example, operate the elevator, the filling conveyor or the discharge conveyor. The position E is meant for filling and emptying of the dryer as well as for transferring the grain by some other means.



Position A
This position is used for automated drying of the grain. The drying phase is controlled by the value set on the outlet air temperature display, and the cooling phase is controlled by the time set in the cooling timer.

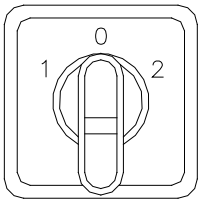


Position K
Drying the grain with manual control. The manual control must only be used under constant supervision. During manual control, neither the outlet air temperature nor the cooling timer controls the drying process. It is also possible to stop the feeder during the drying.

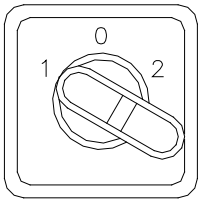
During drying, it is possible to turn the operation switch between positions A and K without the appliances being stopped. This makes it possible, for example, to stop the feeder momentarily for filling the fresh grain silos during the drying phase.

3.1.2 Operating switch for the elevator

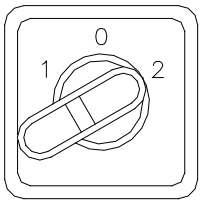
The elevator is controlled by means of a 1 – 0 – 2 switch (8).



Position 0
The elevator is switched off



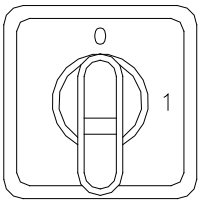
Position 1
The elevator is running continuously. During the drying phase, the switch must stand in the position 1. Then the elevator will run irrespective of the upper limit sensor's state.



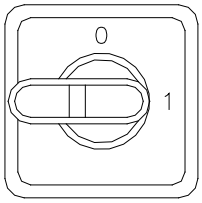
Position 2
Once the surface of the grain reaches the upper limit sensor of the dryer, the elevator will stop. During filling phase, the switch may stand in the position 2. Then the elevator and the feeder will stop as soon as the upper limit switch is reached.

3.1.3 Operating switches for other appliances

The feeder, the pre-cleaner, the bottom screw and the burner are controlled by means of the 0 - 1 switch (9, 10, 11 and 13).



Position 0
The appliance is switched off



Position 1
The appliance is switched on, provided that the stipulations below are being met.

Stipulations:

- The elevator and the bottom screw must be running before the feeder can be started.
- The blower must be running and the safety devices must not be blocking the operation before the burner can be started.

3.1.4 Bypass button

Using the bypass button (3), you can go from the filling phase straight to the drying phase, without stopping the appliances (see 5.1 Filling).

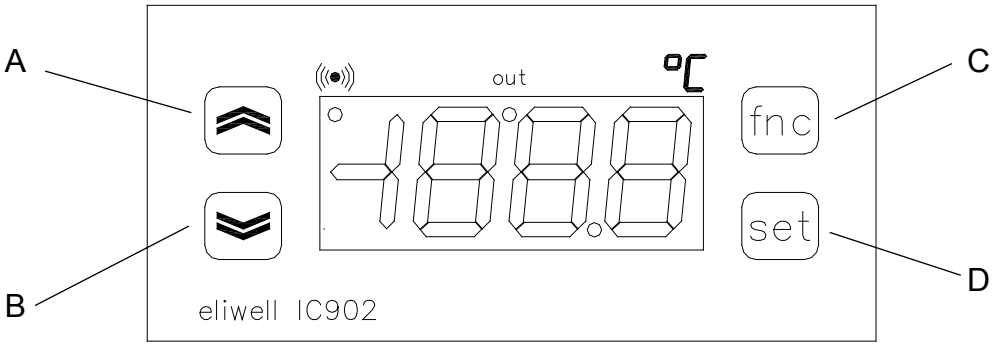
3.1.5 Start button

Using the start button (2), you can start the drying process of grain automatically (see Starting the drying process).

3.2 Operating hour counter

The operating hour counter (6) counts the operating time of the burner blower with an accuracy of 2 decimals. The operating hour counter cannot be reset.

3. 3 Outlet air and drying temperature thermostats

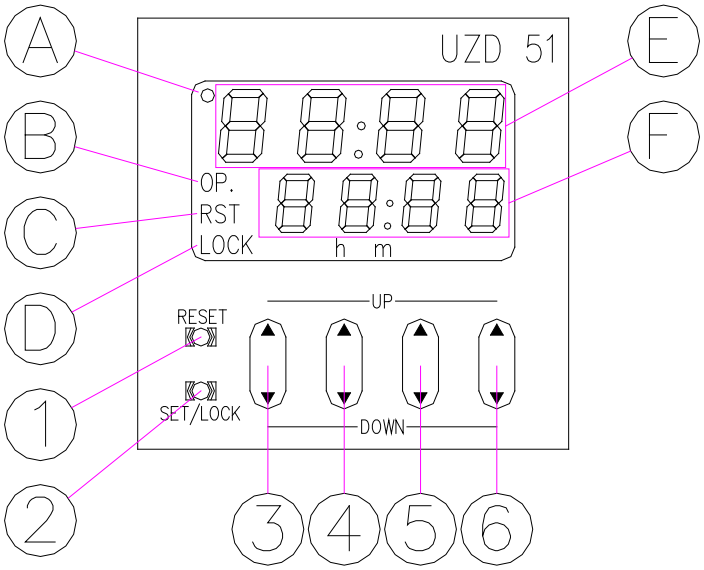


The thermostats for the outlet air temperature and the drying temperature (4 and 5) are used in the similar manner. In its initial state, the thermostat shows the current temperature. Press the SET button (d) twice to show the set value on the display. You can raise or lower the set value using the arrow keys (A and B). The thermostat will return to its initial state in 10 seconds or if you press twice the FNC button (C).

3. 4 Cooling timer

The cooling phase of the dryer is controlled by the time set in the cooling timer (7). Typically, depending on the drying temperature, the cooling time is 1–2 hours. The cooling time must be set to match the circulation time of the grain in the dryer so that the grain batch will have time to circulate at least one round through the machinery during the cooling phase.

3.4.1 Display



A. When the signal light is on, the cooling is in progress
B. The cooling time has ended
C. The drying has been started
D. Key lock active
E. Remaining cooling time
F. Pre-set cooling time

1. Reset button
2. Key lock
3. Double-digit hours
4. Single-digit hours
5. Double-digit minutes
6. Single-digit minutes

3.4.2 Setting the cooling time

Set the cooling time using the buttons 3, 4, 5 and 6. Usually, you only need to press the buttons 4 and 5 since these buttons enable you to set the cooling time with an accuracy of ten minutes.

For example: To set the cooling time to one hour and 30 minutes. Start by pressing the buttons 4 and 5 repeatedly upward until on the display F is shown 1:30.

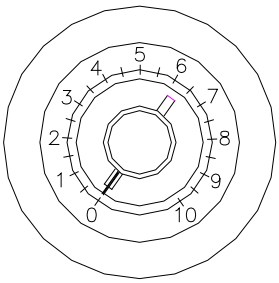
To avoid errors while pressing the buttons, you can lock the keys by pressing the SET/LOCK button (2). The text ”LOCK” (D) will then show on the display. Press the SET/LOCK button again to deactivate the key lock.

3.4.3 Interrupting the cooling

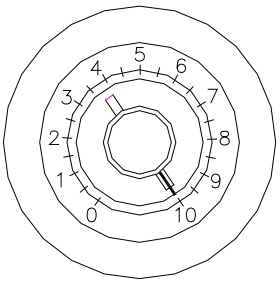
Pressing the keys 3–6, set the cooling time on the display F to ”0:00” and press the RESET button (1). The cooling ends and the signal light "cooling time has ended" will be illuminated.

3.5 Frequency converter controlled feeder

The frequency converter controlled feeder motor enables the circulation speed to be steplessly adjusted during the drying phase. It also makes the emptying of the dryer more convenient by increasing the operating speed of the feeder. It pays to adjust the mechanic eccentric adjuster of the feeder in a manner that enables the maximum speed (85 Hz) to be applied during the emptying. This helps extend the useful adjustment range as much as possible. When the adjustment wheel is turned clockwise, the feeding speed increases, and correspondingly, when turned counter-clockwise, the feeding speed decreases. The lowest allowed operating temperature of the frequency converter controlled feeder is 0 ºC.



Low speed – 25 Hz



High speed – 85 Hz

Initial settings, circulation of grain 1/h				
Model	Volume m³	Weight t	Speed adjustment of the feeder	Eccentric adjuster
C205	18,4	12,9	1	3,5
C255	23,1	16,2	2-3	3,5
C320	29,6	20,7	4	3,5
C365	34,3	24,0	6	3,5
nominal weight of grain		0,7	t/m³	

Emptying by means of the feeder's frequency converter

Using the divider, make the grain flow away from the dryer. Open the elevator door completely. Check that the adjustment wheel of the potentiometer for the feeder's frequency converter is set to its minimum value, i.e. 0, equalling to 25 Hz. Start the elevator, the bottom screw and the feeder. Increase the speed by means of the feeder's potentiometer until the buckets of the elevator start filling up, but the screw in the bottom cone still will not congest. The limiting factor of the mobile dryers C205 and C255 is the capacity of the elevator. In the models C320 and C365, the capacity of the bottom screw is lower than that of the elevator. See also the p. 37, how to adjust the eccentric.

To be observed before starting up

- The test run, carried out by the oil burner fitter, has been completed.
- The operation of the safety devices must be tested in practice to ensure their proper operation.
- The oil-tank must be filled with clean light-oil.
- The air that is blown or sucked through the heater is clean.
- The shut-off valves in the oil piping are in the open position.
- Check once more that the main switches and the possible safety switches are in their operating positions.
- That there is a fire extinguisher near the dryer during the drying.
- That the slab in the front and at both sides of the suction nets is clean and make sure that, for example, the wind cannot blow debris near to the suction opening of the heater.

3.6 Signal lights

3.6.1 Signal lights of the appliances

The signal lights for the elevator, the pre-cleaner, the bottom screw and the burner (14, 15, 16, 17, 18 and 19) are illuminated, when the operating switch of the respective appliance is in position 1, and the stipulations for the operation are being met, i.e. the appliance is running. For example, you cannot start the feeder unless also the elevator is running.

The signal light for the burner's auxiliary nozzle is illuminated, when this nozzle is active. This means that the temperature in the inlet air channel is below the pre-set drying temperature.

3.6.2 Cooling

The signal light for the cooling (22) will be illuminated, when the automatic drying mode is being applied, the cut-off temperature, pre-set on the outlet air thermostat has been reached, and the burner has been switched off, which means that the cooling phase has started.

3.6.3 Signal light "drying finished"

The signal light "drying finished" (23) will be illuminated, when the drying phase in the automatic mode has been completed, and all the appliances have been switched off.

3.6.4 Level guard

The signal light for the level guard (21) will be illuminated, if the surface of the grain has reached the upper level sensor of the dryer, i.e. the dryer is full.

3.6.5 Circulation failure

The signal light "Circulation failure" (24) will be illuminated if the elevator, the bottom screw or the feeder has stopped, although the respective operating switch would stand in position 1.

This may result from overloading of the elevator, the bottom screw or the feeder, and subsequent tripping of the motor protection switch (see Motor protection switches). The circulation failure may also be caused by activation of the elevator's underspeed guard. Find out the reason for the overloading: is the elevator belt too tight or has the elevator possibly congested.

3.6.6 Overheating alarm

The signal light for overheating (25) will be illuminated if the temperature of the inlet air exceeds the value, set in the temperature limiter of the LTM thermostat, or if the drying process is interrupted, while the temperature of the inlet air is over 45 °C. The burner always stands still, when the signal light for overheating is illuminated.

Ensure the access of air to the heater, and in case of a vacuum heater, also the tightness of the air channel doors. The signal light will go out and the burner restart, as soon as the temperature of the inlet air drops below 45 °C.

3.6.7 Burner failure

The signal light for burner failure (26) is illuminated in case a malfunction has occurred in the burner. Find out the reason for the malfunction before resetting it. Refer to the manual for the heater or the burner.

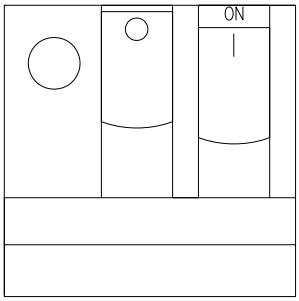
3.7 Motor protection switches

The motor protection (27) switches are being used in the motor outlet for motors with direct or attenuated start to protect the motor against overloading and the wiring against short-circuiting.

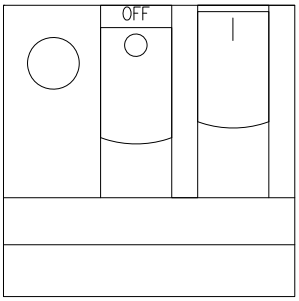
The motor protection switch is on, i.e. the motor is ready for operation, when the black button is depressed as shown in the drawing A. The motor protection switch is off, i.e. the motor has no voltage supply, when the red button is depressed as shown in the drawing B.

When the motor protection switch trips, resulting, for example, from overloading, the black button of the switch bounces up into position B. To reactivate the motor protection switch, press down the black button. You should, however, wait for 10–20 minutes before the restart to prevent the motor and the wiring from overheating.

After several successive start attempts, the motor protection switch may trip, although no actual overloading of the motor has occurred. Even in this case, you should wait for 10–20 minutes before restart.

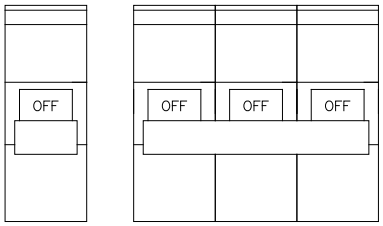


A



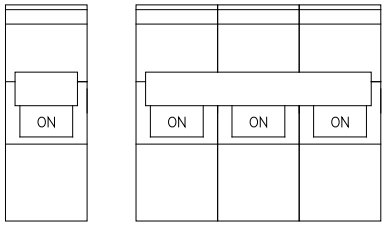
B

3.8 Circuit breakers



The basic electric centre is fitted with a single-phase circuit breaker (28) for the control voltage of the centre, and with three-phase circuit breakers for the heater blower, the burner, and the reactive power compensation unit, that is available as an option.

The circuit breakers are located under the cover of the electric centre.



4. Operation

4.1 Filling

1. Ensure that the divider is in the correct position
2. Turn the control switch to position E (elevator)
3. Turn the elevator switch to position 2
4. Turn the pre-cleaner switch to position 1
5. Open the sluice gate of the filling hopper

Once the surface of the grain reaches the upper limit sensor, the automation system stops the elevator.

If necessary, if the grain, for example, is very moist, the drying and the circulation processes can be started before the filling has been completed. This does not require that the elevator be stopped, provided that the phases 1–5 according to point 4.2.2 have been carried out, and the bypass button has been depressed before turning the selector switch to position A or K. The bypass button must be kept depressed for about 15 seconds (the auxiliary appliance delay) after the blower has switched into the triangle mode.

4.2 Drying and cooling

4.2.1 Drying the first batch

When drying the first batch, the exact cut-off temperature of the outlet air may not yet be known. If this is the case, raise the setting of the outlet air thermostat so much, that the thermostat will not cut off the drying process. Follow the drying of the grain using, for example, a rapid moisture meter. As soon as the desired moisture content for storing has been reached, lower the setting of the outlet air thermostat until the burner stops. If you write down the outlet air settings for different varieties, you can later on make use of your notes for improving the precision of the drying process even more.

Preparations

1. Set the outlet air thermostat to 60 °C
2. Start the drying process as instructed in point 4.2.2
3. Follow the drying process by sampling the moisture content
4. As soon as the desired moisture content has been reached, set the current temperature inside the outlet channel in the outlet air thermostat.
5. Write down the moisture content of the grain, the variety, the drying temperature, the outside air temperature and the cut-off temperature of the outgoing air

4.2.2 Starting the drying process

Phases:

1. Make sure that the divider is in the correct position, and close the sluice gate of the hopper
2. Set the desired drying temperature in the drying temperature thermostat.
3. Set the desired cut-off temperature in the outlet temperature thermostat.
4. Set the desired cooling time in the cooling timer
5. Turn the switches of the burner and the auxiliary appliances (the elevator, feeder, pre-cleaner and bottom suction fan) to position 1
6. Turn the control switch to position A (automatic operation)
7. Press the Start button

As the grain dries, the temperature of the outlet air rises, and as soon as the temperature set in the outlet temperature thermostat is reached, the burner stops and the cooling phase commences. The cooling phase ends as soon as the time set in the cooling timer has run out. When the cooling phase ends, the blower and the feeder stop immediately, and the elevator stops after a delay.

4. 3 Emptying

Turn the selector switch in the control centre to position E, and start the elevator by turning the elevator switch and the bottom screw switch to position 1. The dryer is emptied by increasing the speed of the feeder by means of a frequency converter. Finally, clatter the dryer empty by swinging its emptying cams.

5. Malfunctions

The malfunctions are indicated by relevant signal lights. Always try to find out the cause of the malfunction, before resetting it or restarting the machinery. See point 3.6 Signal lights.

THERMAL INSULATION

Insulating the sections has proved to be the most profitable method of saving energy. According to drying experiments, the saving of energy (or increase of efficiency) ranges from 10 to 15 per cent, depending on the external conditions. A hard stone wool insulation 30 mm thick, reduces the conduction of heat via the outer surfaces to a tenth (82 W/m). It pays to insulate even the top tanks and the sides of the base. This prevents condensing on the inner surfaces, and keeps the dryer tidy and clean on the inside. Insulating the "cold" parts improves even the operation of the dryer.

We recommend using as insulation material the PV-KAT stone wool slab covered with aluminium foil, manufactured by Paroc Oy. It is 30 mm thick and fits perfectly between the external folds of the dryer's outer joints. Use aluminium tape (either heat-sealed or adhesive) to keep the slabs in position.
Insulating the hot air duct (or the ascending part of the outlet pipe, if installed) is even more profitable. For these objects we recommend using stone wool insulation reinforced by net and covered with aluminium foil, such as, for example, Partek PV-80 AVM.

To make the insulation work easier, you can download the installation instructions 408061 for the StandAlone dryer from our material bank on the website of Antti-Teollisuus. You can even purchase the installation kit from Antti-Teollisuus.

OPERATION INSTRUCTIONS FOR THE DRYER MACHINERY (detailed instructions)

Initial adjustment and checking of the dryer

Checking the dryer:

- check that the adjustment of the feeder's speed on the eccentric of the gear motor is not set too high for the first experiments with grain, and that the potentiometer is at point 1. This makes it easier to increase the settings during the operation.
- check that there are no foreign objects, such as, for example, pieces of board or other loose items, inside the dryer
- check that the troughs of the feeders are in the "closed" position
- with the troughs of the feeders in the "closed" position, look from below that the edges of all troughs are on a level – if this is not the case, adjust them as required by moving the holder cam of the emptying cam
- it pays to set the eccentric adjuster of the feeder machinery into such a position, that the capacity of the elevator and/or the bottom screw does not fall short even if the frequency converter is in its fastest position

Drying

In the beginning, when the grain is still moist, the circulation speed can be low. The moisture will evaporate quickly. The heat energy is required for evaporating the water. The temperature of the corn does not rise. During the drying experiments was established that, as the circulation speed was decreased towards the end, also the efficiency was decreased (in combination with reducing the air flow, this, however, slightly improved the overall efficiency). Increasing the circulation speed improves the efficiency, and even more importantly, levels down the humidity differences within the drying batch, because the time that the grain stays in the top tank is shorter. Decrease the feeding rate. For cereal the position of the eccentric shall be 1.5–2.0 with the default value of the frequency converter 50 Hz. When commencing the drying of the first batch, it is best to keep the settings at first low and increase the feeding speed only after the correct values for the other adjustments have been found.

Start the elevator and the pre-cleaner (turn first the selector switch to position E) and tip some grain into the hopper. When opening the sluice gate on the ascending side, the feeding rate very rarely exceeds the lifting capacity of the elevator.
You can start the heater via the bypass button (in the automatic control centre) even if the filling has not yet been completed, but usually, the heater will not be started until the filling has been finished.

Observe the feeding process through the openings in the base. Visually estimated, the amount of grain running down from both edges of each trough should be the same (the feeder blades at the sides may feed slightly more than the other blades). The grain must not congest in the bottom cone. As the drying proceeds, the feeding rate will gradually increase.

Adjust the air flow of the pre-cleaners to as high as possible, however, keeping a watch that no full-weight grains end up among debris. Adjust the pre-cleaner to operate as efficiently as possible as instructed in the manual for the pre-cleaner.

For normal drying, the suitable drying air temperature is 65–80 °C. For bread grain, seed grain and malt grain, the upper limit is 70 °C, for turnip rape it is 65 °C , and for peas around 50 °C . It is possible to apply a temperature, as high as 100 °C, for the fodder grain The temperature is kept constant by means of a suitable pair of nozzles. The burner must operate continuously. If the overheat functionality of the temperature limiter stops the burner, the burner's main nozzle is too large or the injection pressure of the burner is too high.

Adjust the air flow from the heater's air openings so that no grains of normal weight will fly to the outlet end. For turnip rape slight "over flight" is allowed.

Keep an eye on how the drying proceeds. Measure the moisture content from time to time. Once the desired storage humidity is reached, the setting of the outlet air channel thermostat shall be gradually decreased until the signal light for the burner goes out (indicating that the burner has stopped). The setting of the outlet air channel thermostat will now be left in such a position, that next time, when same kind of grain will be dried under roughly same kind of conditions, the automation system is able to cut off the drying process as soon as the same moisture content percentage has be reached. Write down the readings of the outlet air channel thermostat's temperature display (at the end of the drying process) and the outside air temperature. After you have written down notes from several drying batches, you can later make use of them and define even more precise settings for the cut-off temperature of the drying automation.

Cooling

After the drying, the grain must be properly cooled. The cooling process can take less than an hour only in exceptionally cold weather conditions. If the dryer has more top tanks than drying sections, the time required for cooling will be longer. During cooling phase, the moisture content of the grain may still drop slightly, but while in the storage it will resume due to evening out. It pays to measure the moisture content of the grain also after the cooling. As the circulation time of the batch during the cooling phase, depending on the size of the dryer, may be 1–2 hours, readjust the settings for the next batches taking into account that the entire grain volume must have time to circulate inside the dryer at least one full round. (To measure the circulation time in the most reliable way, empty the dryer at the circulation speed and measure the time).

DRYING TECHNICS

During the drying process, you will face a lot of issues, that you should familiarise yourself with in advance.

Adjusting the temperature

1. The primary means of raising the temperature is to increase the oil flow. The auxiliary nozzle of the 2-stage burner will burn intermittently as long as additional heat energy will be required. If the nozzles, not even together, cannot maintain the desired temperature, increase the feeding pressure or change the nozzles to larger ones. These measures, however, are only applicable within the limits for the maximum oil flow allowed for the burner. Refer to the chapter dealing with the burner, above in this manual, for more detailed instructions.

2. As the weather gets colder, you may have to make use of other methods of adjusting the temperature. The next means of raising the temperature (after the maximum oil flow is in use) is to throttle the suction air flow so that the desired drying air temperature will be achieved. The air flow is reduced by means of a manual throttle. The air flow into the dryer heater must always be throttled in the suction air pipe.

Grain variety

The setting of the thermostat and the outlet air temperature slightly vary from variety to variety. If the outlet air temperature 37–38 °C corresponds to the moisture content of 14 % on wheat, the corresponding value for 2-row barley is 38–39 °C, for 6-row barley and oat 34–35 °C , and for turnip rape 32–33 °C (moisture content 9 %). The values may vary from farm to farm, but their order does not change.

Grass seeds

Drying grass seeds requires special arrangements. Tip the load into the filling hopper keeping pace with the elevator. Moist seeds arch easily. The pre-cleaner shall not be used. The circulation speed can be the same as with the grain. Throttle the flow of the drying air until the seeds no longer fly out of the drying section. Do not start the burner until the moisture content has dropped under 25 %. After that you can keep the burner intermittently switched on 0.5–1 hours. Select the sizes of the nozzles so that the drying air temperature will not rise higher than 40–50 °C. Towards the end, the temperature can be increased by 10 degrees.

Turnip rape and rape

The drying must ne commenced immediately after the harvesting. Too high drying air temperature spoils the quality of the oil seeds. The upper limit of the temperature is about 65 °C provided that the circulation time is one hour. The air flow must be limited so that only a non-significant amount of seeds will fly into the outlet air channel (in terms of efficiency, slight "over flight" is, however, positive).

Drying peas

Especially moist peas are difficult to dry. The drying time required is long so as to avoid damaging the surface. If the moisture content is over 20 %, the drying air temperature must not exceed 40 °C. Towards the end, the temperature can be increased by about 10 °C, and/or an interval of 24 hours be kept to allow the moisture to even out. If the peas are really moist, we recommend drying them at intervals, keeping the heat on for two hours, and cooling for half an hour.

Drying temperature

The more uniform the drying temperature, the better the automation operates. If the drying air temperature, however, drops, for example, by 5 °C, the cut-off temperature of the outlet air temperature must be decreased by 1.5–2 °C. If this is not observed, the grain will become 1–2 % dryer.

MAINTENANCE AND OPERATING ADJUSTMENTS

From time to time, check that the scrapers keep the bucket belt pulleys clean. Also check the bucket belt for tightness. As required, tighten the belt by shortening (see the instructions in the elevator manual).

Check that the pressure ends and the return ends are clean (through the doors).
Option: For drying partial batches, close the drying section shutter doors so that no harmful vacuum will be generated inside the top tank.

Note! If you increase the flow of air using the shutter doors, you must also throttle the air flow on the suction side of the dryer heater blower so as to prevent the air pressure in the sections from rising adversely high (the counter-pressure must be the same as during conventional drying). The shutters of the air channels must be provided with open-closed stickers as a reminder of their operating positions at later times of use.

Keep an eye on possible over flight of the grains and the drying temperature. When drying partial batches, the drying automation is less accurate.

In connection with change of variety to be dried, the elevator boot, the bottom suction fan and the feeder shall be cleaned, and for some time air blown into the empty dryer by means of the dryer heater.

ECONOMICAL DRYING

You must select the operating mode as a compromise between the output and the economy. Applying suitable methods, you will be able to improve them both at the same time.

Thermal economy

The correct drying air temperature is the most important factor impacting on the efficiency and economy.

Remember the first main rule:

If the amount of air remains the same, raising the temperature will result in higher output and better economy. As the temperature rises, the drying air's ability to absorb steam is multiplied, and the output increases abruptly. Under normal air pressure, for example, the following amounts of steam correspond to relative humidity of 100 %.

at 0 °C	5	grams of water in m³ of air
at 20 °C	17	“”
at 30 °C	30	“”
at 50 °C	83	“”
at 60 °C	130	“”
at 70 °C	220	“”
at 75 °C	242	“”

Remember that the lower the relative humidity of the drying air, the faster water evaporates from the corns.

One m³ of the dryer heater's suction air at a temperature of +10 °C, and with relative humidity of 90 %, contains 8 g of water. When iy is heated to +70° C, it expands by about 50 %. This amount of air still contains the same 8 g of water, corresponding to the relative humidity of 2.7 %. The air almost "sucks" moisture from the corn. Because the relative humidity of the suction air is less significant, hot air drying is efficient and economical even when it is raining.

Need to reduce the amount of air

You may have dimensioned your dryer and dryer heater following the standards, but you still may encounter situations, where the maximum temperature allowed for the heater (maximum nozzle size) will not raise the drying air temperature sufficiently. In this case, you need throttle the suction opening of the blower so much that the temperature of the drying air will rise. This way you will be able to improve both the dryer's output and economy.

An example of the drying air's ability to absorb steam with the same amount of heat, mixed with different amounts of air:

For warming 10,000 m³ of air from 0 °C to 50 °C is required the same amount of heat than for warming 7,100 m³ of air from 0 °C to 70 °C. Blowing these amounts of air through the grain layers in the dryer, will drop the temperature by the middle of the drying time to about 20 and 27 degrees respectively. Then 10,000 m³ of air at +20 °C can at maximum contain 170 kg of water and 7,100 m³ of air at +27 °C can at maximum contain 188 kg of water. When the air at 0 °C can contain 5 g of water/m³, then with 10,000 m³ of air at 50 °C will go in 50 kg and come out 136 kg (= 86 kg net), and with 7,100 m³ of air at 70 °C will go in 35 kg and come out 150 kg (= 115 kg net).

In practice, the higher the temperature inside the corn during drying, the quicker the water will evaporate causing a pressure difference. This improves the drying efficiency even more than theoretical calculations suggest.

If you are aiming at good economy, you should in certain situations reduce the air amount even if there is no true need to raise the temperature. The aim is to make the air flow through the grain layers sufficiently slowly. If the air is flowing too fast, it may not be able to evaporate the amount of water entirely that it otherwise would be able to absorb. If the air leaves the heater too dry (i.e. too hot), useful heat energy will also be wasted. If you reduce the amount of air, you may need to reduce the oil flow as well (the 2-stage automation does this automatically). This is a concrete way of saving energy.

Equilibrium moisture content

The dryer the grain gets, the slower the water evaporates from the grains. As a result, the relative humidity of the outlet air decreases as the drying proceeds.

How to reduce the amount of air

The flow of suction air into the heater is throttled by means of a manual air shutter.

If you restrict the flow of suction air into the heater too much, the temperature of the drying air will rise too high, and the upper limit thermostat will stop the burner from time to time Do not let this happen, as it would drastically reduce the efficiency of the drying process, and strain the dryer heater clearly more than if the production of heat was constant. For remedy, increase the air flow or reduce the oil flow.

Measuring the amounts of air

The amounts of air can only be measured under test conditions. Relatively, the amount of air can, however, be measured by measuring the pressure of air inside the dryer's inlet air channel. The pressure of air is indicated by the height difference of the water surfaces.
Example! 15 mm below zero and 15 mm above zero makes together 30 mm of water column (counter-pressure)

The more the air flow is throttled, the lower the counter-pressure.

The desired value for grain is 20–40 mm and for turnip rape 30 mm.

Large variations in results are due to changed measuring locations, and the properties of the pipelines. Therefore, the counter-pressure meter is better suited to measuring variations within one dryer unit rather than comparing different dryers.

OTHER FACTORS OF ECONOMICAL DRYING

Avoid drying too much (for example: for drying from 14 % to 12 %, you need the same amount of energy than for drying from 19 % to 14 %).

Avoid drying partial batches, because then the output will also be partial and the output will be reduced.

The settings of the oil burner affect the thermal efficiency directly. The adjustments of the burning air must be correct. If you change nozzles or change the oil pressure, readjust the burning air flow.

Assign a specialised oil burner workshop for maintenance of the burner at intervals of 2–3 years – also the nozzles shall be changed. This way you may not need to maintain the burner yourself at all.
The operator must, however, keep the heater room and the protective net for the suction air opening clean of dust and debris.

Good maintenance of the machinery improves the economy of the operation.

After each annual sweeping, ensure after closing the sweeping door that the seal of the door is absolutely tight.

Avoid drying in the night time, At night the drying always requires more purchased energy than in the daytime.

Make sure that the elevator lifts the grain at full power during the filling and the emptying.

Keep the output setting of the pre-cleaner's blower as high as possible keeping in mind the limit for the variety in question.

POSSIBLE MALFUNCTIONS

If the feeder stops and the signal light "Circulation failure" is illuminated

- the fuse for the feeder motor has blown
- the fuse for the bottom screw has blown
- the elevator has stopped

If the elevator stops, and the signal light "Circulation failure" is illuminated, (as a result of the above, the feeder, the bottom screw and the burner will stop in the automatic position).

- see the malfunctions of the elevator in the Installation and Instruction Manual for the elevator.

Malfunctions in the burner:

- out of oil
- light resistance cell sooty of blown
- water in the oil filter or the filter is clogged
- one of the shutter valves for the oil pipes is closed
- thermo-relay for the motor has tripped
- service switch for the oil burner is in position 0
- no supply of air to the burner
- refer to the Installation and Instruction Manuals for the dryer heater and the oil burner for more detailed malfunction tables

If the signal lights for the drying and the cooling phases in the automatic centre are illuminated simultaneously, while the selector switch is in position MANUAL, and –when the switch is turned into position AUTOMATIC – the burner stops, then turn the cooling timer to position 0. Reset the cooling time, and check that the temperature setting of the digital thermostat is higher than the temperature inside the outlet channel. Press the Start button of the dryer The drying process will commence normally.
Note! the elevator, the bottom screw and the feeder must be running.

SERVICE AND WINTER MAINTENANCE

Lubricate once a week

- elevator bearings
- bottom screw bearings
- feeder bearings
- transmission arms of the feeder (2–3 drops of oil)

Annually

- maintenance of the oil burner (assign a specialist)
- checking the feeder motor gearbox (check oil leaks)

Winter maintenance

Clean the dryer thoroughly Clean the dryer's bottom cone, the feeders, the air channel ends, and the inner surfaces of the top tanks. Clean the blower of the pre-cleaner.
Leave the cleaning doors open, but close the suction opening of the dryer heater. Close the doors at the elevator boot to prevent the rodents from eating the bucket belt.

GUARANTEE

The guarantee period for the Antti-dryers is one (1) operating season. The guarantee covers defects in material and workmanship. Separate guarantee terms issued by the respective importer apply to the electric motors.

A prerequisite for validity of the guarantee is that the instructions issued by the manufacturer and the valid regulations have been followed during installation, use and service of the dryer.

All matters related to the guarantee shall be agreed upon with the manufacturer before any action is taken.

EU Declaration of Conformity

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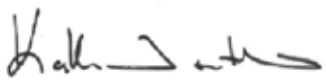
declares that

AGROSEC VACBOOST MOBILE DRYER M13

conforms with the provisions of the following directives:

- **Machine Directive 2006/42/EC**
- **Low Voltage Directive 2006/95/EC**
- **Electro-Magnetic Compatibility Directive (EMC) 2004/108/EC**

Kuusjoki 20.09.2012



Managing Director